HF ALL BAND TRANSCEIVER
GENERAL COVERAGE RECEIVER

IC-751A

SERVICE MANUAL

ICOM INCORPORATED
1-6-19, Kamikuratsukuri, Hirano-ku, Osaka 547, Japan
Phone: (06) 793-5301
Telex: ICOM TR J63649

ICOM AMERICA, INC.,
2380 116th Avenue N.E.,
Bellevue, WA 98004
Phone: (206) 454-8155
Telex: 230-152210 ICOM AMER BVUE
Fax: (206) 454-1509

3150 Premier Dr., Suite 126,
Irving TX 75063
Phone: (214) 550-7525
Fax: (214) 550-7423

1777 Phoenix Parkway, Suite 201,
Atlanta, GA 30349
Phone: (404) 991-6166

ICOM CANADA, LTD.,
3071-#5 Road, Unit 9,
Richmond, B.C.,
V6X 2T4 Canada
Phone: (604) 273-7400
Fax: (604) 273-1900

ICOM (EUROPE) GmbH,
Himmelgeister Strasse 100,
4000 Düsseldorf 1,
West Germany
Phone: 0211-346047
Telex: 41-8588082 ICOM D
Fax: 0211-333639

ICOM AUSTRALIA, PTY., LTD.,
7 Duke Street, Windsor 3181,
Victoria, Australia
Phone: (03) 529-7582
Telex: 71-35521 ICOMAS
Fax: (03) 529-8485

FOREWORD

Thank you very much for selecting ICOM's versatile **IC-751A** HF transceiver, a refined version of the very popular IC-751.

Doubling as both a sophisticated HF multi-mode transceiver and all-purpose general coverage receiver, the **IC-751A** is the result of advanced HF engineering at ICOM and was designed to ensure years of reliable and satisfactory communications for the avid Amateur Radio enthusiast.

ASSISTANCE

The **IC-751A** was designed to be used all over the world, with some slight modifications made for its use in Australia and France. The Australia and France versions of the **IC-751A** are assigned model #03. This number should be referred to in these countries when assistance or information regarding the **IC-751A** is required. The assigned **IC-751A** model number for all other parts of the world is #02.

Feel free to contact your nearest authorized ICOM Dealer or ICOM Service Center if you require assistance or information regarding the operation or capabilities of your new **IC-751A**. Addresses are provided on the title page of this service manual.

TABLE OF CONTENTS

SECTION 1 SPECIFICATIONS

1 - 1 GENERAL

Number of semiconductors	: Transistors	59
	(Australia, France:	61)
	FETs	23
	Diodes	336
	ICs (Includes CPU)	64
Frequency coverage	: Ham Bands	
	1.8MHz ~ 2.0MHz	
	3.45MHz ~ 4.1MHz	
	6.95MHz ~ 7.5MHz	
	9.95MHz ~ 10.5MHz	
	13.95MHz ~ 14.5MHz	
	17.95MHz ~ 18.5MHz	
	20.95MHz ~ 21.5MHz	
	24.45MHz ~ 25.1MHz	
	27.95MHz ~ 30.0MHz	
	General Coverage (Receive Only)	
	0.1MHz ~ 30.0MHz	
Usable temperature range	: −10°C ~ +60°C (+14°F ~ +140°F)	
Frequency control	: CPU based 10Hz step digital PLL synthesizer.	
	Independent transmit/receive frequency.	
Frequency readout	: 6 digit 100Hz illuminated FIP.	
Frequency stability	: Less than ±200Hz from 1 to 60 minutes after power ON.	
	Less than ±30Hz after 1 hour at 25°C.	
	Less than ±350Hz in the range of 0°C ~ +50°C.	
Power supply requirements	13.8V DC ±15% (negative ground), current drain 20A maximum at 200W input.	
	AC power supply is available for AC operation.	
Current drain (at 13.8V DC)	: Transmitting	
	At 200 watts input	Approx. 20.0A
	Receiving	
	At maximum audio output	Approx. 1.8A
	Squelched	Approx. 1.5A
Antenna impedance	: 50 ohms unbalanced.	
Weight	: 8.5kg	
Dimensions	: 306(322)mm(W) x 115(120)mm x 355(385)mm(D)	
	Bracketed values include projections.	

1 - 2 TRANSMITTER

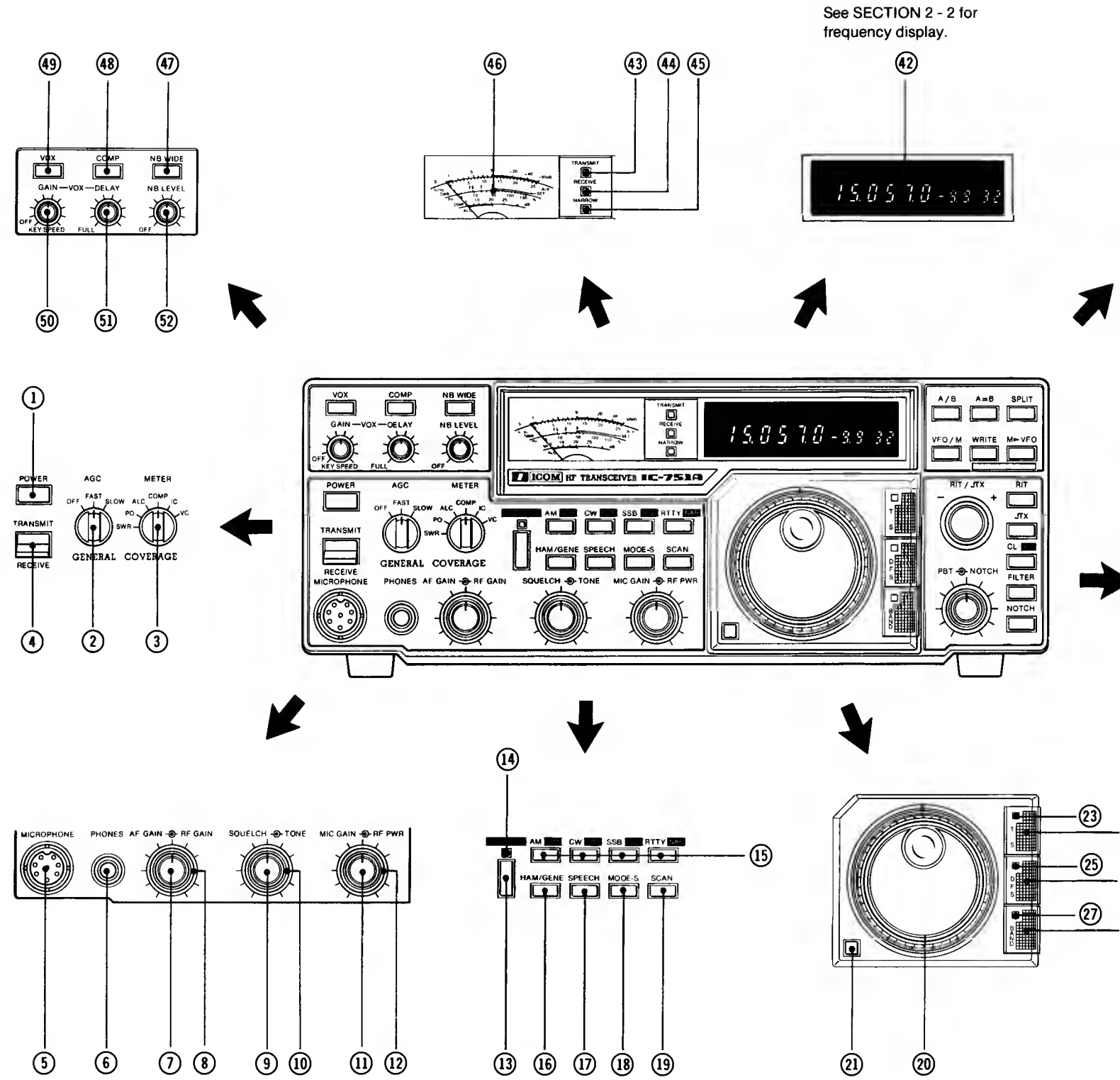
RF power	: SSB (J3E)	: 200 watts PEP input
	CW (A1A)	: 200 watts input
	FM (F3E)	: 200 watts input
	RTTY (F1A)	: 200 watts input
	AM (A3E)	: 50 watts output
Emission modes	: SSB (J3E) Upper and Lower sideband	
	CW (A1A)	
	FM (F3E)	
	RTTY (F1A)	
	AM (A3E)	
Harmonic emissions	: More than 40dB below peak power output.	
Spurious emissions	: More than 60dB below peak power output.	
	(Guaranteed for transmissions within the Amateur bands.)	
Carrier suppression	: More than 40dB below peak power output.	
Unwanted sideband	: More than 55dB down with 1000Hz AF input.	
Microphone	: Impedance 600 ohms	
	Input level 12 millivolts typical	
	Dynamic or electret condenser microphone.	
ΔTX variable range	: ±9.9kHz	

1 - 3 RECEIVER

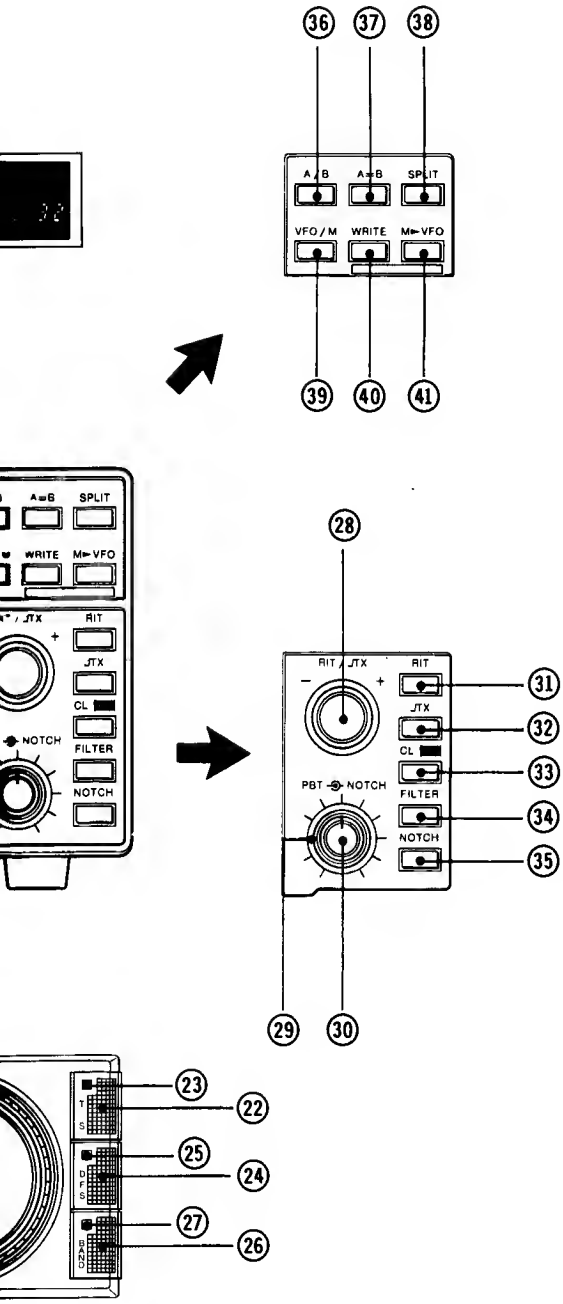
Receive system	:	SSB, CW, RTTY, AM Quadruple-conversion superheterodyne with continuous bandwidth control. FM Triple-conversion superheterodyne.
Receive modes	:	SSB (J3E) Upper and Lower sideband CW (A1A) FM (F3E) RTTY (F1A) AM (A3E)
Intermediate frequencies	:	1st: All modes 70.4515MHz 2nd: SSB 9.0115MHz CW, RTTY 9.0106MHz FM, AM 9.0100MHz 3rd: All modes 455kHz 4th: SSB 9.0115MHz CW, RTTY 9.0106MHz AM 9.0100MHz
Sensitivity (PREAMP ON)	:	SSB, CW, RTTY 0.1 ~ 0.5MHz Less than 0.5μV for 10dB S/N 0.5 ~ 1.6MHz Less than 1μV for 10dB S/N 1.6 ~ 30.0MHz Less than 0.15μV for 10dB S/N AM (NARROW FILTER selected) 0.1 ~ 0.5MHz Less than 3μV for 10dB S/N 0.5 ~ 1.6MHz Less than 6μV for 10dB S/N 1.6 ~ 30.0MHz Less than 1μV for 10dB S/N FM 28 ~ 30MHz Less than 0.3μV for 12dB SINAD
Squelch sensitivity	:	1.6 ~ 30MHz Less than 0.3μV
Selectivity	:	SSB, CW, RTTY (WIDE FILTER selected), AM (NARROW) 2.3kHz at −6dB point 3.8kHz at −60dB point CW, RTTY 500Hz at −6dB point 1.3kHz at −60dB point FM 15kHz at −6dB point 30kHz at −50dB point AM (WIDE FILTER selected) 8kHz at −6dB point 18kHz at −50dB point
Spurious and image response rejection	:	Image rejection More than 80dB IF rejection More than 70dB
Audio output	:	More than 2.6 watts at 10% distortion with 8 ohm load.
Notch filter attenuation	:	More than 45dB
RIT variable range	:	±9.9kHz

SECTION 2 OUTSIDE AND INSIDE VIEWS

2 - 1 FRONT PANEL



for



① POWER SWITCH
② AUTOMATIC GAIN CONTROL SWITCH [AGC]
③ METER SWITCH
④ TRANSMIT/RECEIVE SWITCH

⑤ MIC CONNECTOR [MICROPHONE]
⑥ PHONES JACK
⑦ AF GAIN CONTROL
⑧ RF GAIN CONTROL
⑨ SQUELCH CONTROL
⑩ TONE CONTROL
⑪ MIC GAIN CONTROL
⑫ RF POWER CONTROL [RF PWR]

⑬ FUNCTION SWITCH
⑭ FUNCTION INDICATOR
⑮ MODE SWITCHES
⑯ HAM BAND/GENERAL COVERAGE SWITCH [HAM/GENE]
⑰ SPEECH SWITCH
⑱ MODE SCAN SWITCH [MODE-S]
⑲ SCAN START/STOP SWITCH [SCAN]

⑳ TUNING CONTROL
㉑ DIAL LOCK SWITCH
㉒ TUNING SPEED SWITCH [TS]
㉓ TS INDICATOR
㉔ DIAL FUNCTION SELECT SWITCH [DFS]
㉕ DFS INDICATOR
㉖ BAND SELECT SWITCH [BAND]
㉗ BAND SELECT INDICATOR

㉘ INCREMENTAL TUNING CONTROL [RIT/ΔTX]
㉙ PASSBAND TUNING CONTROL [PBT]
㉚ NOTCH FILTER CONTROL [NOTCH]
㉛ RIT SWITCH
㉜ ΔTX SWITCH
㉝ RIT/ΔTX CLEAR SWITCH [CL]
㉞ FILTER SWITCH
㉟ NOTCH FILTER SWITCH

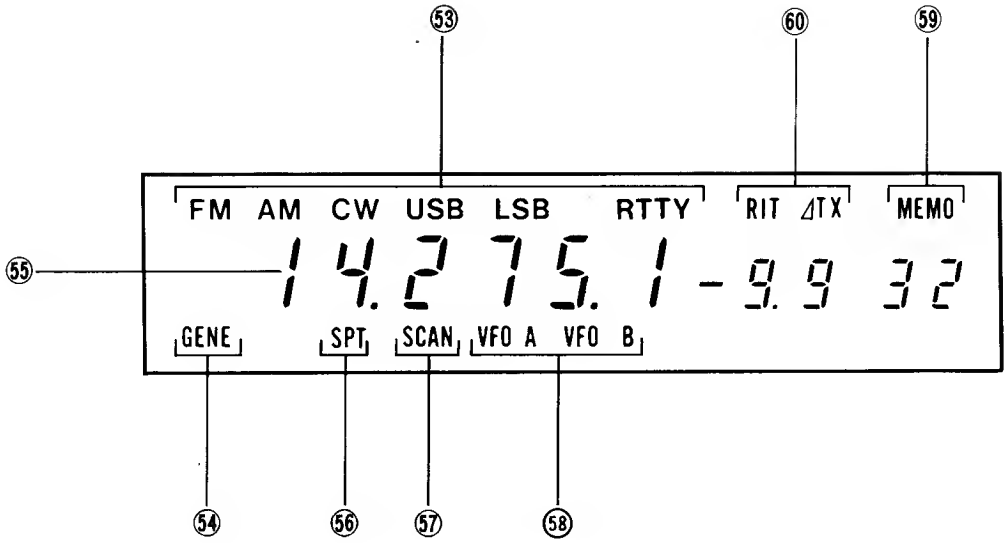
㊱ VFO A/B SWITCH [A/B]
㊲ VFO EQUALIZING SWITCH [A=B]
㊳ SPLIT SWITCH
㊴ VFO MEMORY SWITCH [VFO/M]
㊵ MEMORY WRITE SWITCH [WRITE]
㊶ FREQUENCY TRANSFER SWITCH [M▶VFO]

㊷ FREQUENCY DISPLAY

㊸ TRANSMIT INDICATOR
㊹ RECEIVE INDICATOR
㊺ NARROW FILTER INDICATOR [NARROW]
㊻ MULTIFUNCTION METER

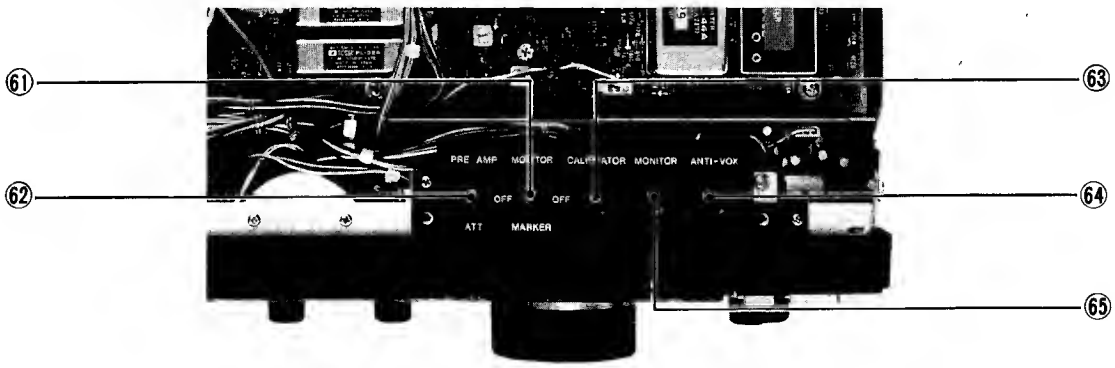
㊼ NOISE BLANKER TIMING SWITCH [NB WIDE]
㊽ SPEECH COMPRESSOR SWITCH [COMP]
㊾ VOX SWITCH
㊿ VOX GAIN CONTROL
(51) VOX DELAY CONTROL
(52) NOISE BLANKER LEVEL CONTROL [NB LEVEL]

2 - 2 DISPLAY



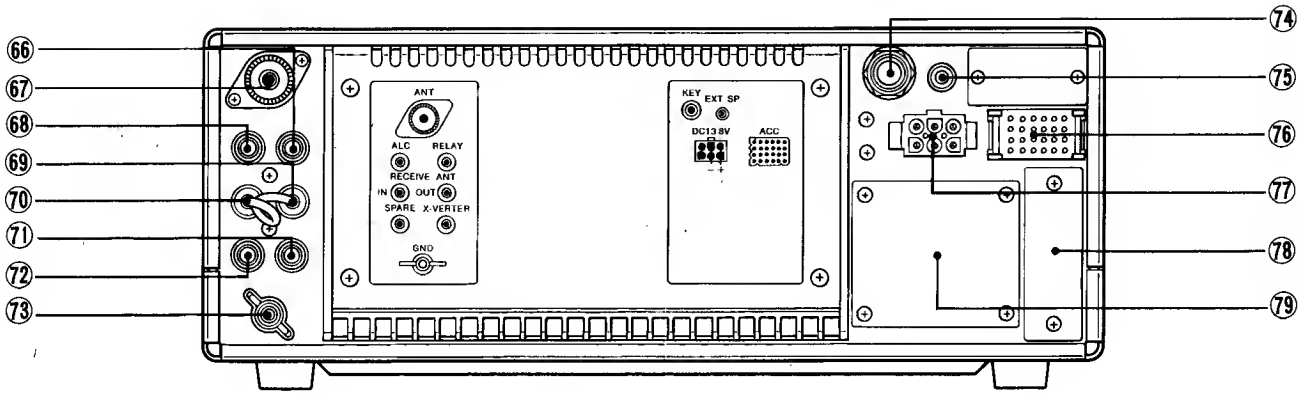
53 MODE INDICATOR
54 GENERAL COVERAGE INDICATOR
55 FREQUENCY READOUT
56 SPLIT INDICATOR
57 SCAN INDICATOR
58 VFO INDICATOR
59 MEMORY INDICATOR
60 SHIFT FREQUENCY INDICATOR

2 - 3 TOP PANEL



61 MONITOR/MARKER SWITCH
62 PREAMP/ATT (ATTENUATOR) SWITCH
63 MARKER CALIBRATOR CONTROL
64 ANTI-VOX CONTROL
65 MONITOR LEVEL CONTROL

2 - 4 REAR PANEL



⑥⑥ T/R CONTROL JACK [RELAY]

⑥⑦ ANTENNA CONNECTOR

⑥⑧ EXTERNAL ALC JACK [ALC]

⑥⑨ RECEIVE ANTENNA OUTPUT [RECEIVE ANT OUT]

⑦⓪ RECEIVER INPUT [RECEIVE ANT IN]

⑦① TRANSVERTER JACK [X-VERTER]

⑦② SPARE JACK

⑦③ GROUND TERMINAL

⑦④ KEY JACK

⑦⑤ EXTERNAL SPEAKER JACK

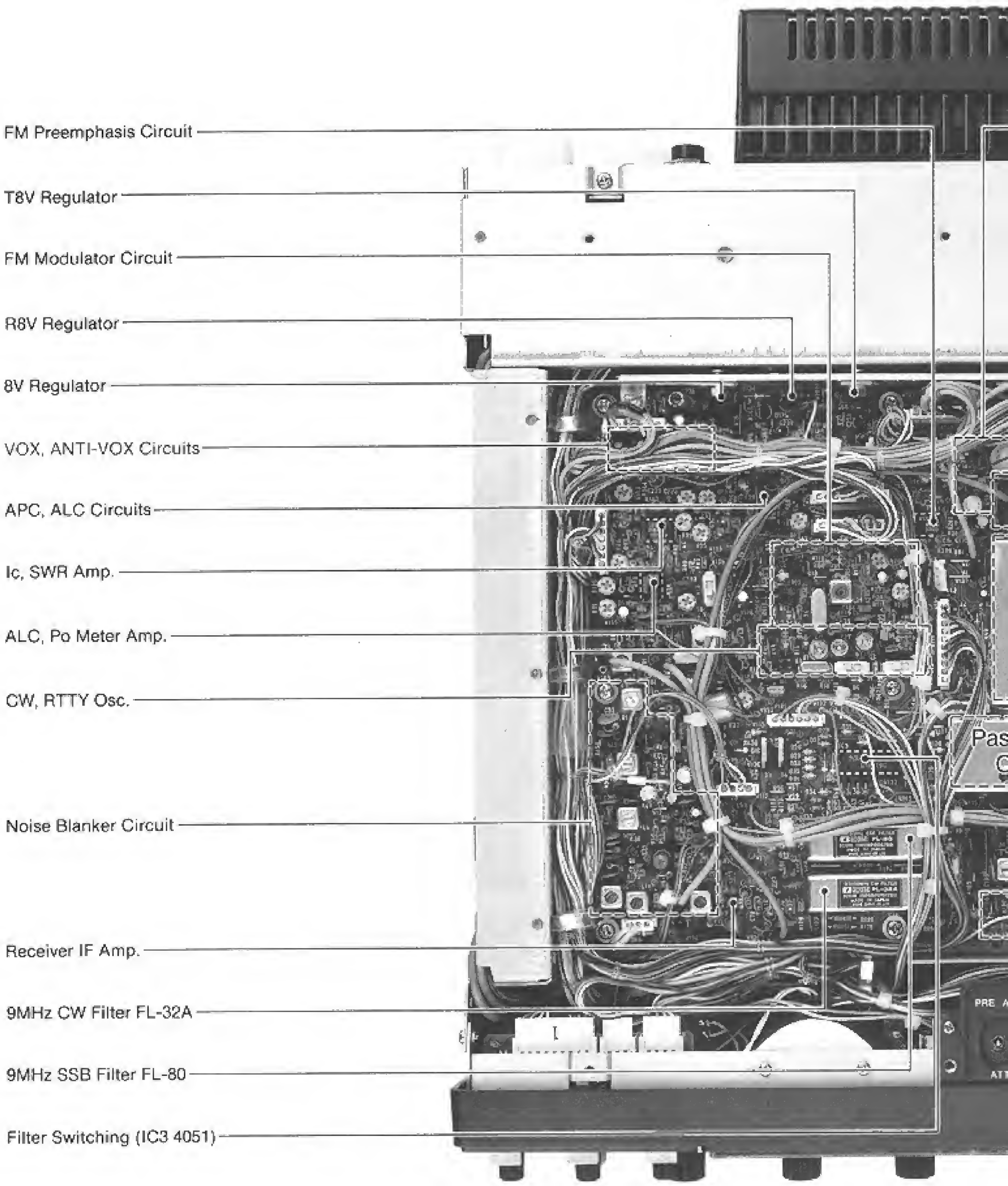
⑦⑥ ACCESSORY SOCKET

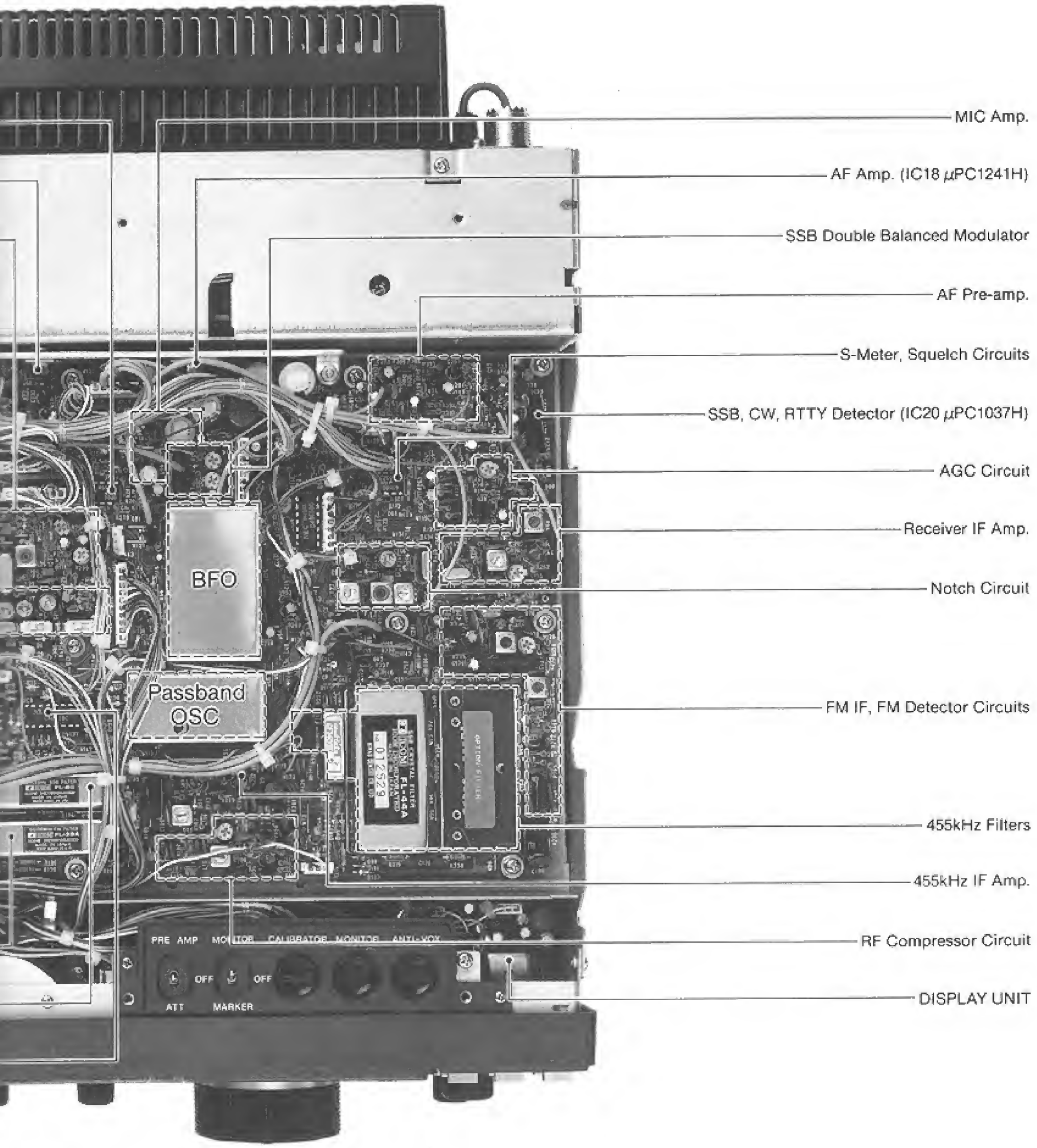
⑦⑦ DC POWER SOCKET [DC 13.8V]

⑦⑧ IC-EX309 (OPTIONAL) INTERFACE UNIT CONNECTOR POSITION

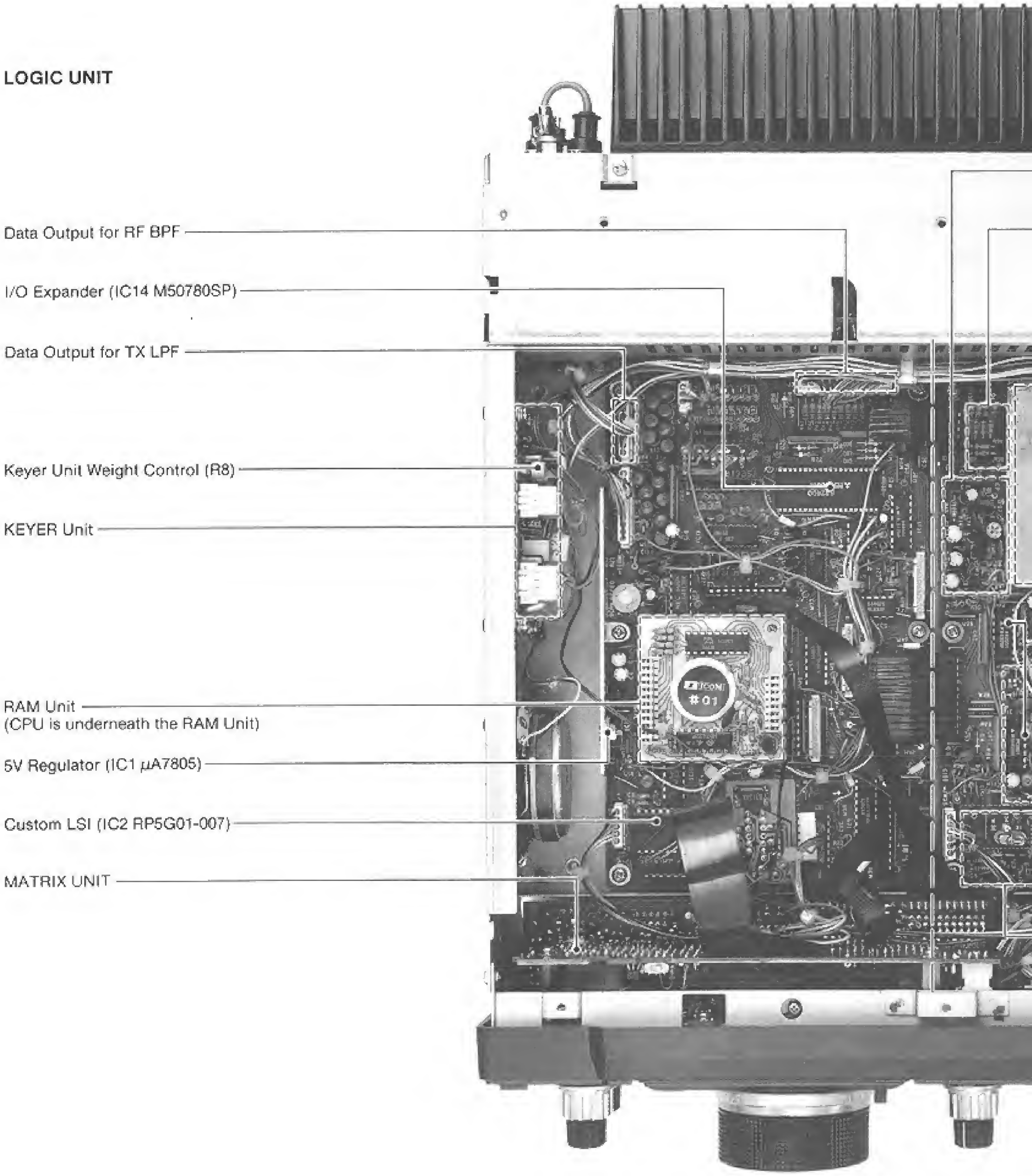
⑦⑨ IC-PS35 (OPTIONAL) AC POWER SUPPLY SOCKET POSITION

2 - 5 MAIN UNIT

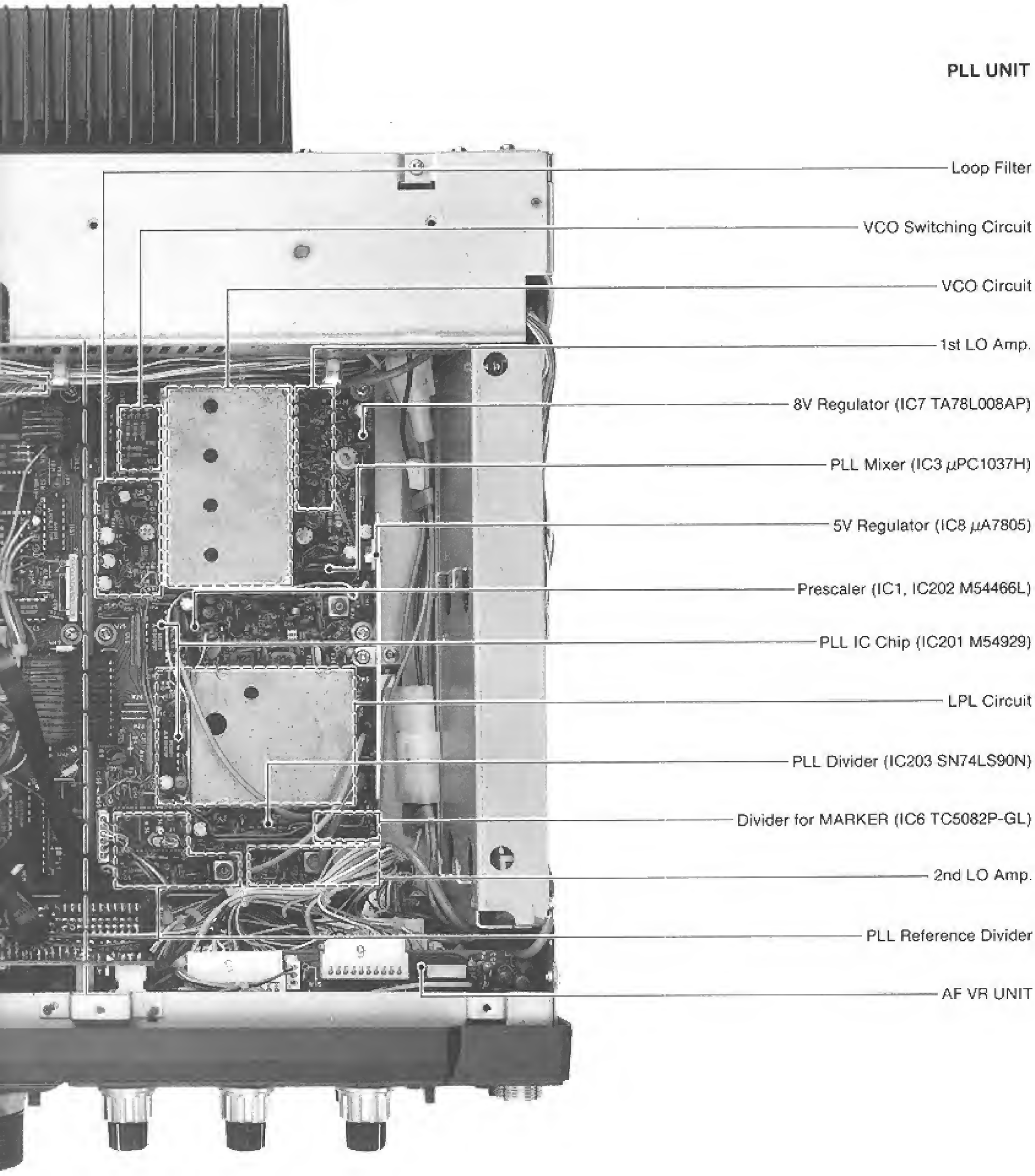

FM Preemphasis Circuit
T8V Regulator
FM Modulator Circuit
R8V Regulator
8V Regulator
VOX, ANTI-VOX Circuits
APC, ALC Circuits
Ic, SWR Amp.
ALC, Po Meter Amp.
CW, RTTY Osc.
Noise Blanker Circuit
Receiver IF Amp.
9MHz CW Filter FL-32A
9MHz SSB Filter FL-80
Filter Switching (IC3 4051)


MIC Amp.
AF Amp. (IC18 μPC1241H)
SSB Double Balanced Modulator
AF Pre-amp.
S-Meter, Squelch Circuits
SSB, CW, RTTY Detector (IC20 μPC1037H)
AGC Circuit
Receiver IF Amp.
Notch Circuit
FM IF, FM Detector Circuits
455kHz Filters
455kHz IF Amp.
RF Compressor Circuit
DISPLAY UNIT
BFO
Passband OSC
PRE AMP
OFF
OFF
ATT
MARKER

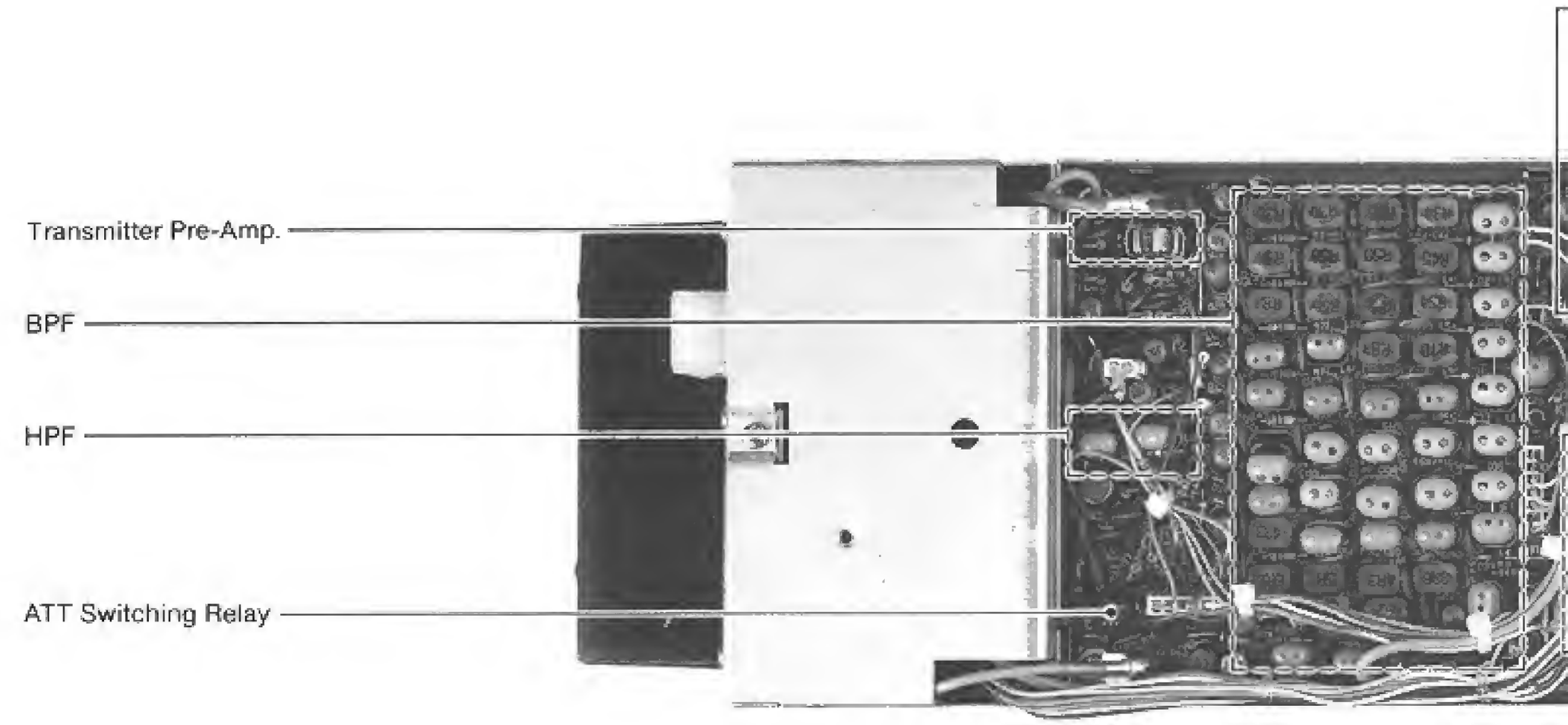
LOGIC UNIT


Data Output for RF BPF
I/O Expander (IC14 M50780SP)
Data Output for TX LPF
Keyer Unit Weight Control (R8)
KEYER Unit
RAM Unit
(CPU is underneath the RAM Unit)
5V Regulator (IC1 μA7805)
Custom LSI (IC2 RP5G01-007)
MATRIX UNIT

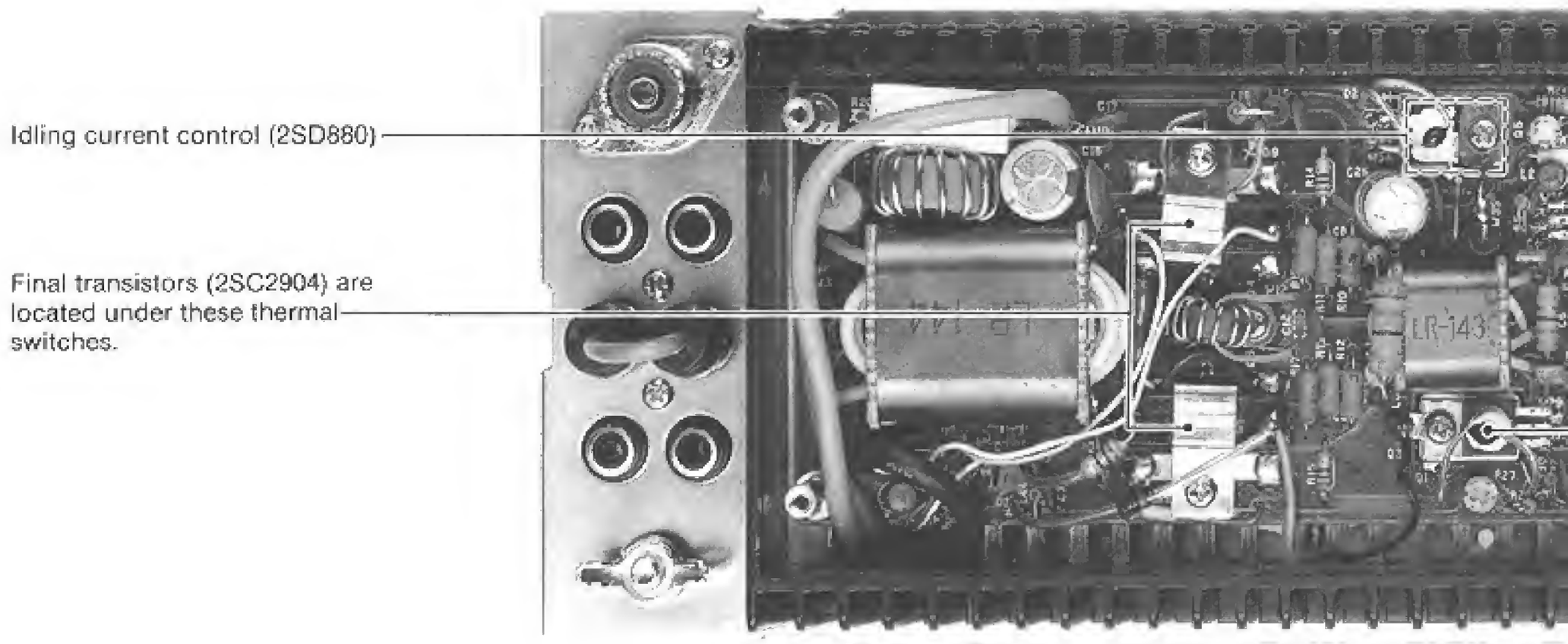
PLL UNIT

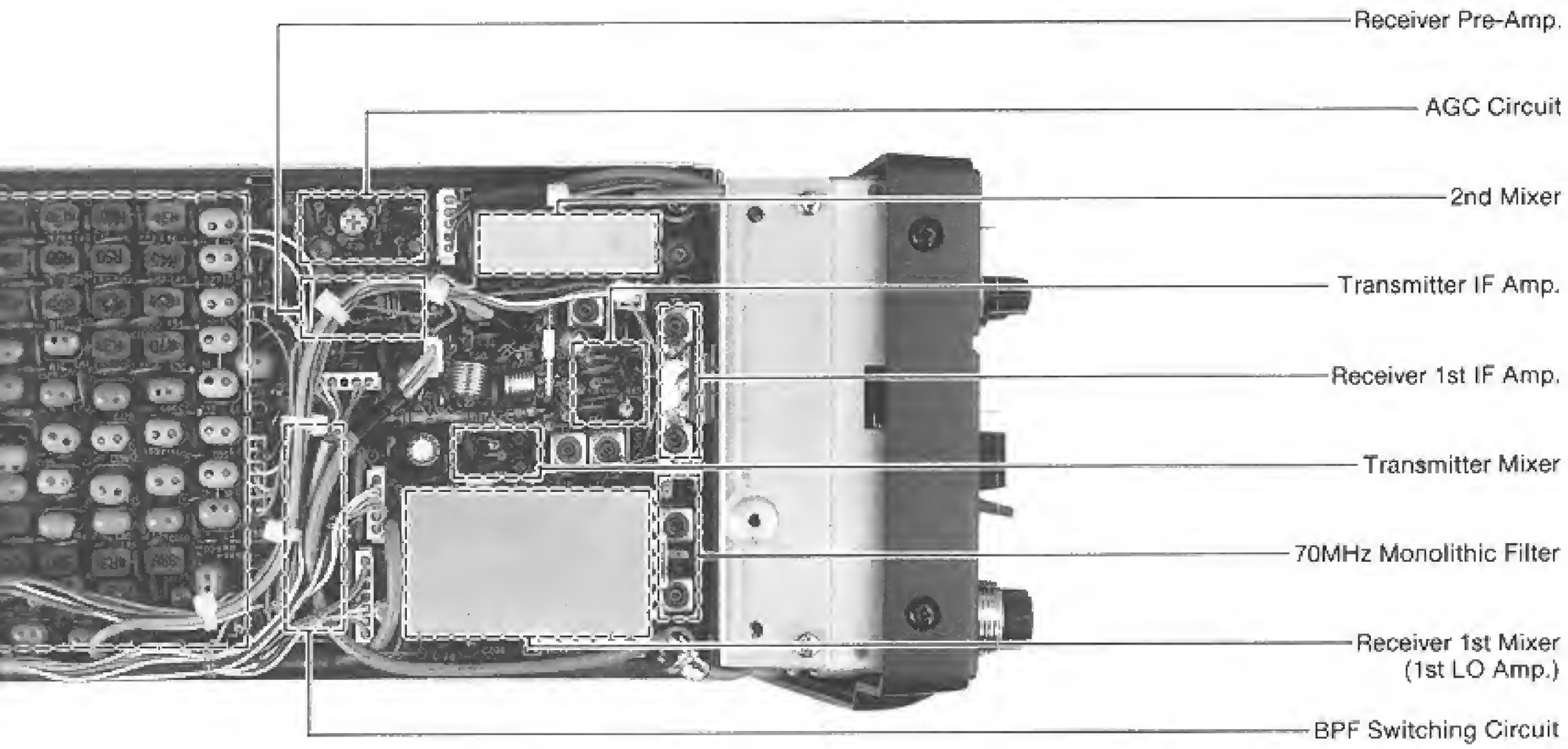

Loop Filter
VCO Switching Circuit
VCO Circuit
1st LO Amp.
8V Regulator (IC7 TA78L008AP)
PLL Mixer (IC3 μPC1037H)
5V Regulator (IC8 μA7805)
Prescaler (IC1, IC202 M54466L)
PLL IC Chip (IC201 M54929)
LPL Circuit
PLL Divider (IC203 SN74LS90N)
Divider for MARKER (IC6 TC5082P-GL)
2nd LO Amp.
PLL Reference Divider
AF VR UNIT

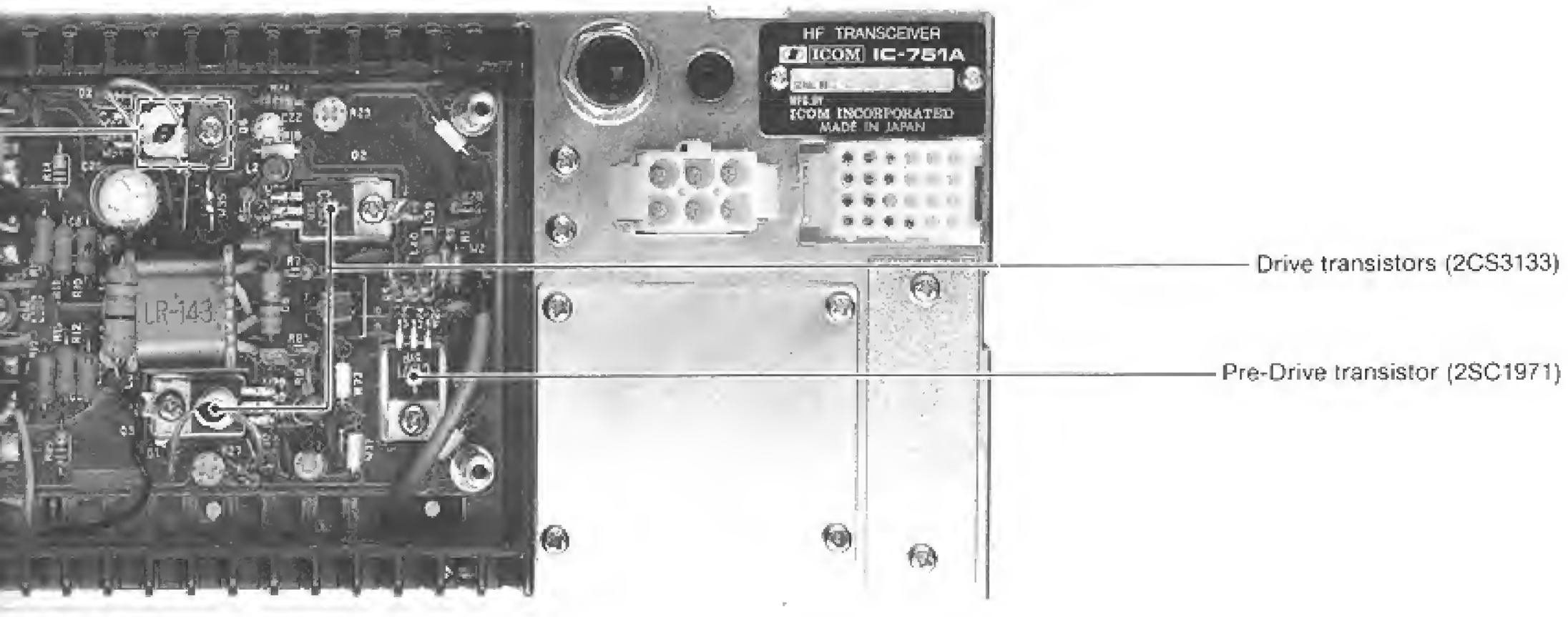
2 - 7 RF UNIT



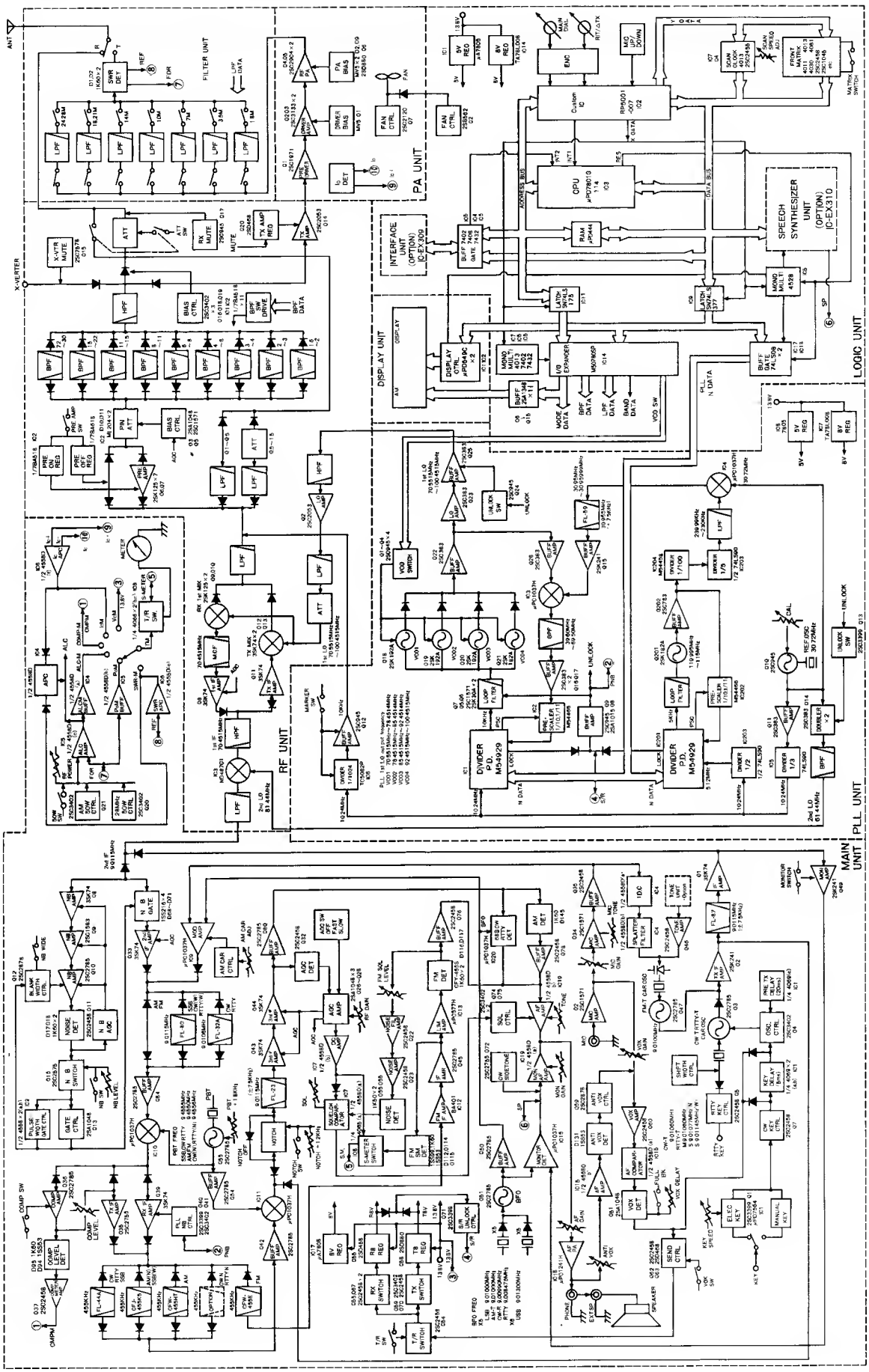
2 - 8 PA UNIT




Receiver Pre-Amp.
AGC Circuit
2nd Mixer
Transmitter IF Amp.
Receiver 1st IF Amp.
Transmitter Mixer
70MHz Monolithic Filter
Receiver 1st Mixer
(1st LO Amp.)
BPF Switching Circuit


HF TRANSCEIVER
ICOM IC-751A
ICOM INCORPORATED
MADE IN JAPAN
Drive transistors (2CS3133)
Pre-Drive transistor (2SC1971)

SECTION 3 BLOCK DIAGRAM



SECTION 4 CIRCUIT DESCRIPTION

4 - 1 RECEIVER CIRCUITS

4 - 1 - 1 RF CIRCUITS (RF AND CONNECTOR UNITS)

Receive signals from the antenna connector are fed into J10 on the RF UNIT when D4 and RL1 on the CONNECTOR UNIT are respectively turned OFF and ON. A reed relay is used for RL1 to provide full break-in operation. The T/R switching time of this relay is less than one millisecond, compared to more than 12 milliseconds with a regular relay.

Incoming signals to the RF UNIT pass through an L-type attenuator which consists of R92, R93, and R119. Signals are attenuated at 20dB when the [PREAMP ATT] SWITCH is set in the [ATT] position. Incoming signals are fed into one of three different circuits depending on the receive frequency range.

(1) 100~500kHz : Signals are fed through a low-pass filter by D44.

(2) 500~1600kHz : Signals are fed by D42 into a 10dB attenuator and low-pass filter to attenuate strong signals from AM broadcasting stations.

(3) More than 1600kHz : Signals are fed by D47 into a high-pass filter consisting of L101, L102, and C180 C182. This filter attenuates strong radio signals in the BC band. The signals are then passed into one of nine bandpass filters depending on the frequency of the signal.

Filtered signals are fed into an L-type attenuator which consists of R28 and PIN diodes D10 and D11 which are controlled by AGC bias voltage from Q3, Q4, and Q5. D10 and D11 are linear diodes which are similar to RF variable resistors, depending on current flow when no signal is being received. The voltage of the AGC line from the MAIN UNIT is approximately 4V at this time and the emitter voltage of Q5 is approximately 2.8V. Therefore approximately 15mA flows through D11. This AGC voltage turns OFF Q3 and approximately 0.7V are generated by R32.

The AGC circuit operates when signals are received, lowering Q5. The current flow of D11 is therefore reduced, making resistance higher. Q3 then turns ON and allows the current to flow through D10, lowering resistance. This voltage function in the circuit provides variable attenuation to a maximum of 10dB.

When the [PREAMP ATT] SWITCH is in the [PREAMP] position, signals from the attenuator are fed into a broad-band amplifier which consists of Q6 and Q7. Gain from this amplifier is approximately 10dB. If the [PREAMP ATT] SWITCH is turned OFF or is in the [PREAMP] position, signals bypass this amplifier through D12 and D13.

Signals are fed through one of two filters depending on whether their frequencies are greater or less than 1600kHz. Signals are then passed through a low-pass filter which improves image rejection characteristics and reduces spurious emissions from the ANTENNA CONNECTOR via the local oscillator. Signals are fed into the 1st mixer through T/R Switching Diode D20.

BPF switching voltage is obtained via IC1 and IC2 through the decoding of band signals B1~B11 from the LOGIC UNIT. ON and OFF switching voltages are provided by IC2. R13V is emitted from an OR gate which consists of D5 and D6. Immediate release of this control voltage is provided by D1 and D2 when switching to transmit mode.

L-TYPE ATTENUATOR CIRCUIT

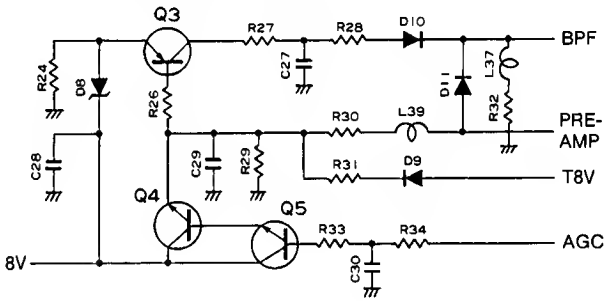


Fig. 1

4 - 1 - 2 IF CIRCUITS

1. RF UNIT

Q9 and Q10 create a double-balanced mixer which uses low-noise FETs (2SK125) and is driven by 13.8V to provide an excellent noise figure. Multi-signal receiving characteristics are determined by the 1st mixer circuit. The double-balanced mixer has a high interception point and reduces spurious characteristics in signals. The IC-751A has a very high dynamic range (100dB in SSB mode and 104~105dB in CW mode) and uses a mixer with a high intercept point figure. The [ATT] SWITCH position is effective for strong receive signals with 20dB attenuation. The [PREAMP] SWITCH position is more effective with weaker signals since PREAMP provides an excellent noise figure and amplification, and increases the receive sensitivity by approximately 6dB.

TWO SIGNAL RECEIVE CHARACTERISTICS

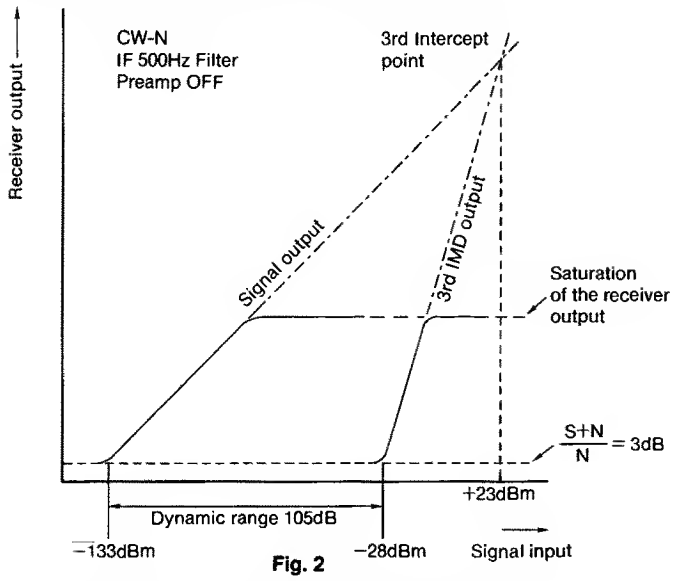


Fig. 2

The 1st mixer circuit is an upconverter which converts receive signals into 70.4515MHz 1st IF signals.

The 1st LO output signal from the PLL UNIT is fed through a high-pass filter, amplified by Q2, filtered by a low-pass filter, and then is applied to the 1st mixer as a local oscillator signal (70.5515~100.4515MHz). R18, L13, and C14 are designed as feedback functions to improve the frequency characteristics of Q2.

The 1st IF signal is filtered by a monolithic crystal filter (FI1, ±7.5kHz/−3dB) and then is amplified by a dual-gate FET (Q8), the 2nd gate of which is controlled by the AGC voltage.

Signals are fed through T/R Switching Diode D19 and a high-pass filter to the 2nd IF mixer of Double-Balanced Mixer IC3 where the signals are converted into 9.0115MHz 2nd IF signals. The signals are then filtered in order to have local oscillation components removed by a low-pass filter before being fed to the MAIN UNIT through P3.
2nd LO signals (61.44MHz) from the PLL UNIT are fed to IC3 as local oscillator signals for the 2nd mixer.

2. MAIN UNIT

9MHz 2nd IF signals from J4 pass through Q33, a noise-blanker gate and amplifier. After being amplified at Q33, signals are fed through a filter select switch circuit and into a 9MHz IF filter.

Noise blanker gate D68~D71 is a diode balanced-type switch circuit which passes signals through it. Signals are cut by this gate when control voltage from the noise blanker circuit is applied to D72.

Mode switches and the [FILTER] SWITCH on the front panel send signals into the circuit which select a 9MHz IF circuit section consisting of FI2 and FI8.

Filtered signals amplified at Q84 are fed into the 3rd mixer, IC10. 9.4665MHz (± SHIFT frequency) signals are supplied as local oscillator signals from Q55 to IC10 (pin 7) in order to obtain 455kHz 3rd IF signals. 3rd IF signals are buffer amplified at Q39 and fed into the 455kHz filter section of the circuit. The 455kHz section consists of FI3~FI6 and an optional narrow filter (in CW and RTTY modes). 3rd IF signals are selected as in the 9MHz section.

Signals from the 455kHz filter are converted to 9MHz again by IC11, the 4th mixer. When the transceiver is in FM mode, output from FI6 (the FM filter) is applied to the FM receive circuit. 9MHz-converted signals pass through the notch circuit and are amplified at Q43 and Q44 before being fed into the detector and APC circuits.

4 - 1 - 3 FILTER SECTION (MAIN UNIT)

The IC-751A has two filter sections (9MHz and 455kHz) for passband tuning and high selectivity.

The 9MHz filter section consists of a through circuit in AM and FM modes, FI2 in SSB, CW, and RTTY modes, and FI8 in CW Narrow and RTTY Narrow modes. 9MHz 3rd IF frequencies are 9.0115MHz in SSB mode, 9.0100MHz in AM and FM modes, and 9.00106MHz in CW and RTTY modes.

The 455kHz filter section consists of FI3, FI4, FI5, and FI6. These filters consist of several other filters which are listed below.

- FI3 : Contains an SSB High Shape Factor Filter, an SSB Filter, a CW Filter, and an RTTY Filter.
- FI4 : Contains an SSB Wide and RTTY Narrow Filter.
- FI5 : Contains an AM Filter.
- FI6 : Contains an FM Filter and optional CW Narrow and RTTY Narrow Filters.

The above filters are selected by control signals from the filter switching circuit using the switch circuit. Refer to SECTION 4-2-19 FILTER SWITCHING CIRCUIT for more information regarding filters and a combination of filter switches or modes.

4 - 1 - 4 NOISE BLANKER CIRCUIT

A portion of 2nd IF signals from the RF UNIT is fed into a noise amplifier circuit consisting of Q8, Q9, and Q10. This circuit has high gain and a wide AGC dynamic range. It amplifies weak signals, giving them higher sensitivity with a wider dynamic range.

Amplified signals from Q10 are detected by D17 and D18, and are then fed into Q11 (the noise AGC) and Q13 and Q15 (noise switches). The bias voltage of Q8, Q9, and Q10 is decreased by Q11 to control the gain of the noise amplifier. This noise AGC has a time constant determined by R46, R47, and C31, and functions as an average-type AGC circuit. The AGC therefore responds to SSB signals such as those without sharp leading edges or those that are constant-amplituded. Rectified voltage of the noise AGC is constant. However, rectified voltage will exceed the threshold level of the determined voltage when noise with a sharp leading edge is received.

Q15 controls the gate control circuit when the rectified voltage exceeds the threshold level. The threshold level is controlled by the NOISE BLANKER [NB] CONTROL on the

front panel which alters the emitter voltage of Q15. Q12, the noise blanker gate, closes when noise is received. Q15 then turns ON with the rectified voltage.

The noise blanker circuit contains a delayed pulse-width circuit which consists of a Miller integrator and a comparator. The output signals from this circuit combine with an output signal from Q13 and the combined signal is used for controlling the noise gate circuit. This allows the noise blanker circuit to blank wide-width pulse noise called woodpecker noise. When the NOISE BLANKER TIMING SWITCH is set at the [WIDE] position, the noise blanker does not function with pulse noise which is less than 1 millisecond of pulse width.

Q12 controls the blanking time and prevents blanking for more than 1 to 2 milliseconds and 10 milliseconds when the [NORMAL] and [WIDE] positions are selected, respectively. This results in a distortion-free audio signal. The limits of blanking time are determined by D16, R56, R57, C39, and C40. Q10 prevents noise blanking times from exceeding the above limits, automatically stopping the function when the limits are reached.

4 - 1 - 5 NOTCH CIRCUIT

A notch circuit is installed in the IC-751A with a 9MHz crystal filter function. This circuit uses a bridge-type notch filter and achieves very sharp attenuation and stability using a crystal unit.

Notch frequency can be altered by a capacitance change of varicap D110 which is installed in series with crystal unit X2. When the notch circuit is not turned ON with the [NOTCH] SWITCH, both the input and output of the notch circuit are grounded by D109.

Monolithic filter FI7 is connected to the next stage of the notch circuit and eliminates spurious signals emitted from mixer IC11.

4 - 1 - 6 DETECTOR CIRCUIT

Signals amplified in the receive IF circuit pass into IC20 for detection of the SSB, CW and RTTY modes, and into D145 for detection of the AM mode through buffer amplifier Q80.

The product detector for the SSB, CW and RTTY modes functions in IC20, a balanced mixer IC chip. BFO signals are applied to IC20 for each mode. In the AM detector, D145 rectifies IF signals and the rectified signals are received at Q79, a high impedance emitter follower circuit which improves the distortion ratio of the rectified signals.

4 - 1 - 7 AGC CIRCUIT

The IC-751A has a fast attack/slow release-type AGC system which maintains the peak voltage of rectified IF signals from the IF amplifier circuit for a brief period of time. The AGC circuit provides a dual gate MOSFET in each IF amplifier circuit. AGC voltage is applied to the PIN attenuator in the RF UNIT, obtaining a dynamic range of 100dB.

AGC CIRCUIT SCHEMATIC DIAGRAM

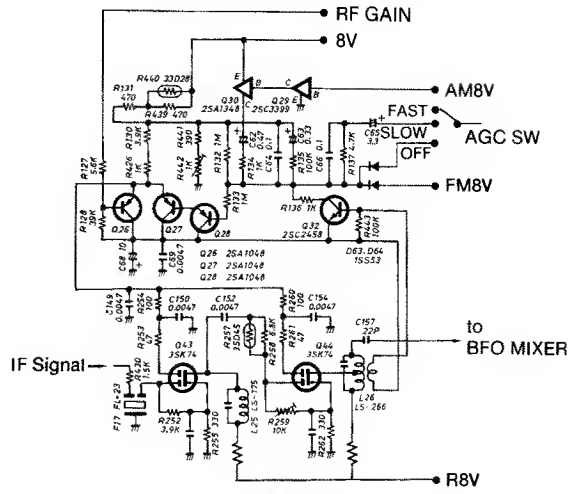


Fig. 3

The time constant of the AGC circuit is selectable, and has three positions, [FAST], [SLOW], and [OFF] for suitable operation.

The received IF amplifier output signals are detected and amplified at Q32. Then, the output of Q32 is connected to a time constant circuit consisting of capacitors and resistors which change the AGC release time. Q27 and Q28 control the AGC voltage. The AGC voltage is set for approximately 4.4V when no signal is received. The voltage will decrease depending on the signal strength of received signals.

When the [AGC] SWITCH is set in the [SLOW] position, R137, C65 and C66 are added to the normal time constant circuit to obtain a longer AGC release time. When the [AGC] SWITCH is set in the OFF position, 8V is applied to the base of Q28 through D64. Therefore, the AGC circuit does not function. The AGC circuit also does not function in FM mode.

4 - 1 - 8 FM IF AMPLIFIER AND DETECTOR CIRCUITS

When FM mode is operating, IF signals are passed through FI6 (a 455kHz filter) and are amplified at IC12 and Q45, and then are limiter amplified at IC13. After being amplified, signals are fed into a detector circuit consisting of D1, D2, and ceramic discriminator X3. Detected signals are deemphasized by an integrated circuit consisting of R405 and C246, and are then applied to the AF preamplifier circuit.

4 - 1 - 9 AF AMPLIFIER CIRCUITS

Audio signals from IC20 or Q76 are amplified at IC19(b) and fed into a tone control circuit consisting of R394 and C258 on the MAIN UNIT and the [TONE] CONTROL on the front panel. After passing through the tone control circuit, audio signals pass through the [AF GAIN] CONTROL on the front panel and are then fed into IC18, the power amplifier. IC18 drives the speaker at more than 3W with 8 ohms of resistance.

Q74 and Q75 comprise a squelch switching circuit which cuts audio output. Output signals from IC19(b) are applied to the rear panel AF OUT pin in the ACCESSORY SOCKET.

4 - 1 - 10 S-METER CIRCUIT

When operating in FM mode, output signals from Q45 (an FM IF signal amplifier) are detected by D114 and D115, and are then applied to the S-METER. D112 is a compression circuit which maintains the S-METER dynamic range at approximately 40dB.

When operating in modes other than FM, AGC voltage is amplified by a differential amplifier which consists of Q26~Q28 and IC7(h). AGC voltage is then supplied to the S-METER. Offset in the differential circuit is adjusted by R132 and sets the S-METER at 0. An AGC reference voltage is adjusted by R442 to obtain excellent meter linearity. When the [AGC] SWITCH is in the OFF position, AGC voltage is fixed and the S-METER will not operate.

4 - 1 - 11 SQUELCH CIRCUIT

(a) NOISE SQUELCH (FM MODE)

A portion of the output signals from the FM detector circuit pass through the [SQUELCH] CONTROL on the front panel. They are then applied to the noise amplifier circuit on the MAIN UNIT. The [SQUELCH] CONTROL is a double variable resistor, so it can be used to squelch noise and the S-METER.

The noise amplifier circuit consists of an active filter (Q22) and noise amplifier (Q23). Q22 detects 10~20kHz noise components which are determined by L9 and C55. Noise components amplified at Q23 are detected by D55 and D56, and are then applied to comparator IC7(g).

When operating in FM mode, pin 2 on IC7(g) is at 0V, as determined by Q83, and the S-METER squelch control voltage is grounded by Q25. When no detected voltage is supplied from D56, pin 3 on IC7(g) is at a negative voltage, as determined by R117. The output of IC7(g) is therefore "LOW" and thus the squelch switching circuit (consisting of Q74 and Q75) is turned OFF (squelch opens). Q24 receives the output of IC7(g) through D57, turning ON and OFF the RECEIVE INDICATOR.

When a detected voltage is supplied from D56 (no signal being received), pin 3 on IC7(g) is greater than 0V and the output of IC7(g) is "HIGH". Q74 and Q75 then turn ON, cutting the audio signal.

(b) S-METER SQUELCH

When operating in a mode other than FM, IC7(g) receives S-METER voltage at pin 2 and reference voltage from the [SQUELCH] CONTROL at pin 3. When the [SQUELCH] CONTROL is turned CCW to its maximum position, the reference voltage is approximately −0.5V; when turned maximum CW the reference voltage is approximately +2.5V. When the S-METER voltage is lower than the reference voltage, Q74 and Q75 are turned ON, closing the squelch.

4 - 2 TRANSMITTER CIRCUITS

4 - 2 - 1 MIC AMPLIFIER CIRCUIT

An audio signal from the MIC CONNECTOR is amplified at Q2, the mic preamplifier circuit in the AF VR UNIT, and then passes through the [MIC GAIN] CONTROL. The signal is then applied to the mic amplifier circuit which consists of Q34 and Q35, and passes through the [TONE] CONTROL which consists of R154, R155, C86, and C87. Frequency characteristics of the audio signal are controlled by R155. The MOD terminal on the ACC CONNECTOR socket is connected to the base of Q35 through R148 and C83.

IC-751A MIC CONNECTOR (Front View)

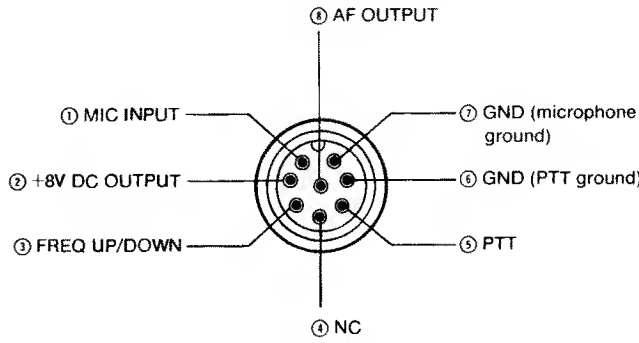
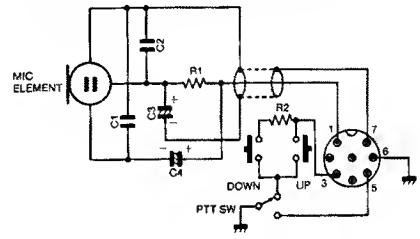


Fig. 4

HM-36 SCHEMATIC DIAGRAM



R1: 2kΩ
R2: 470Ω
C1: 4700pF
C2: 4700pF
C3: 10μF
C4: 0.33μF

Fig. 5

4 - 2 - 2 BALANCED MODULATOR CIRCUIT

When operating in SSB or AM mode, an audio signal from the mic amplifier circuit is applied to balanced mixer IC9 where it is mixed with a BFO signal. A double sideband (DSB) signal is then output from IC9. In SSB mode, the bias voltage of IC9 is adjusted by R158 and R161, reducing the carrier signal. In AM mode, R159 and D75 add voltage to pin 5 on IC9, disrupting the balance and generating an AM signal.

4 - 2 - 3 SSB AND AM TRANSMITTER IF CIRCUITS

A DSB or AM signal generated at IC9 is applied to the 9MHz filter as in the receiver circuits. In SSB mode, the DSB signal passes through FI2, creating an SSB signal. In AM mode, an AM signal passes through the circuit. After passing through the filter, a signal is buffer-amplified at Q84 and fed into mixer IC10 for conversion into a 455kHz 2nd IF frequency signal. This 2nd IF frequency signal is applied to Q38 directly when the [COMP] SWITCH is OFF or indirectly through the compressor circuit when the [COMP] SWITCH is ON.

A 455kHz filter, buffer amplifier Q42, and mixer IC11 are commonly used with the receive circuit, so 455kHz 2nd IF frequency signals are re-converted to 9MHz 3rd IF frequency signals and are applied to Q1, the transmitter IF amplifier.

4 - 2 - 4 COMPRESSOR CIRCUIT

The compressor circuit increases the average power needed to limit amplitude when in SSB mode. Since amplitude is limited with an IF frequency signal, signal distortion is slight.

SSB signals from IC10 are amplified at Q36 and are amplitude limited by diode limiters D92 and D93. Parts of the

signals from Q36 are detected at D94 and D95 and are then current amplified by Q37 and applied to the COMP METER. When the [COMP] SWITCH is OFF, output from IC10 is applied directly to Q38 by D90.

4 - 2 - 5 CW, RTTY OSCILLATOR CIRCUITS

In CW or RTTY mode, Q3 and X1 oscillate the transmit carrier signal. In CW mode, oscillation is controlled by the external keys. In RTTY mode, the oscillating frequency is controlled by C17 and C20.

The emitter resistor of Q3 is connected to the collector of Q4 to control oscillation. When Q5 or Q6 is activated, D4 is turned ON by R17, R18 and R19. C15~C20 are then series connected to X1 to oscillate 9.0106MHz (an RTTY marker frequency or a CW oscillator frequency). When both Q5 and Q6 are OFF, D4 is also OFF, thus capacitors C19 and C20 or C17~C20 (which are controlled by S1, the Shift Selection Switch on the MAIN UNIT) are cut from X1 to oscillate either 9.01077MHz (the 170Hz shift frequency) or 9.01145MHz (the 850Hz shift frequency), respectively.

Q5 is an inverter for changing the Mark and Shift polarities in RTTY modes. Polarity is fixed by S2 on the MAIN UNIT, the RTTY Polarity Switch. In CW mode, Q5 receives voltage from D5, so S2 has no relation to the oscillation frequency which is 9.0106MHz.

4 - 2 - 6 CW KEYING CIRCUIT

A keying signal from the [EXT KEY] JACK is applied to Q4 through a delay circuit which consists of IC1, R31, and C23 (delay time is approximately 6ms). Transmit and receive switching time is approximately 20ms, but when using full break-in operation RF signals are delayed for less than 6ms.

4 - 2 - 7 FM OSCILLATOR AND MODULATOR CIRCUITS

An audio signal from the mic amplifier circuit is fed into IC14(a), a limiter amplifier, through C175 and R279, the pre-emphasis circuit. After being amplified at IC14(a), an audio signal is applied to IC14(b), a splatter filter which reduces distortion components. The signal is then applied to the FM modulator circuit.

Output from IC14(b) is applied to the anode of D118 and signals oscillated by Q47 and X4 are frequency modulated. Output from a UT-30 optional tone encoder is amplified at Q46 and is then applied to the anode of D118, the same as an audio signal. ON and OFF switching in the UT-30 is controlled by the FUNCTION LED voltage. when the FUNCTION LED lights up, the UT-30 is activated.

Audio deviation is adjusted by R292 and subaudible tone deviation is adjusted by R290. Output signals from the FM local oscillator circuit are buffer amplified at Q2 and are then applied to Q1, the same as in CW and RTTY modes.

4 - 2 - 8 BFO CIRCUIT

This circuit oscillates local signals for detection of SSB, RTTY, and CW modes via IC20 and for detection of the monitor circuit via IC15. The circuit provides balanced modulation with IC9.

The oscillation frequency should be as follows:

USB	:	9.01300MHz
LSB, AM (Receive)	:	9.01000MHz
CW (Receive)	:	9.00990MHz
RTTY (Receive)	:	9.008475MHz

The circuit oscillates using X6 in USB mode and X5 with L33, L34 and L35 connected in series in LSB, CW and RTTY modes, respectively. The circuit stops oscillating when the transceiver is operating in AM receiving and CW transmitting as Q52 and Q53 provide no voltage to the circuit.

4 - 2 - 9 TRANSMITTER IF AMPLIFIER CIRCUITS

1. MAIN UNIT

9MHz IF frequencies from the oscillator circuit of each mode pass through monolithic filter FI1 to remove spurious components. The signals are then fed into Q1. Gate 1 of Q1 receives ALC voltage and gate 2 receives control voltage from the power control unit.

2. RF UNIT

IF signals from the MAIN UNIT pass through a low pass filter circuit and are converted into 70.4515MHz signals by IC3, a balanced mixer diode. 9.0115MHz noise components are removed from the output of IC3 by a high pass filter consisting of C64~C66. 61.44MHz noise components are removed by a series resonance circuit consisting of L30 and C67. Signals are then amplified at Q11, a dual gate FET that receives ALC voltage through D22, a T/R switching diode.

Amplified signals from Q11 are fed into Q12 and Q13, the transmit mixer circuit, through a double tuning circuit consisting of L32, L33, and C77. Spurious noise components are then removed from the signal by the 2nd gate of Q12 and Q13 which receive local frequencies with DC bias voltage that eliminates signal spuriousness. Signals are then converted to the desired frequency of 0.1~30MHz.

Converted signals pass through a low pass filter to have local oscillator components eliminated. They are then fed to an attenuator circuit consisting of pin diodes and to a receiver preamplifier bypassing circuit consisting of D12 and D13. In transmit mode, this circuit is provided with bias voltage from D9. Signals then pass through one of nine bandpass filters that are selected by a voltage from the LOGIC UNIT before being fed through a high pass filter.

In receive mode, D47 is ON. In transmit mode, D47 turns OFF since Q16 (ON) and Q18 (OFF) combine to reverse the bias of the diode. Q16 and Q18 are bandpass filter switching transistors that control other diodes such as D26, D28, D30, D32, D34, D36, D38, and D40. Note that current flows through L99 and L100.

In transmit mode, D45 turns ON and signals are wideband-amplified by Q14 and output to the PA UNIT.

When a transverter is used, D46 turns ON and inputs a converted receive signal to the transceiver or outputs a low level transmit signal from the transceiver through the transverter terminal.

RF UNIT BLOCK DIAGRAM

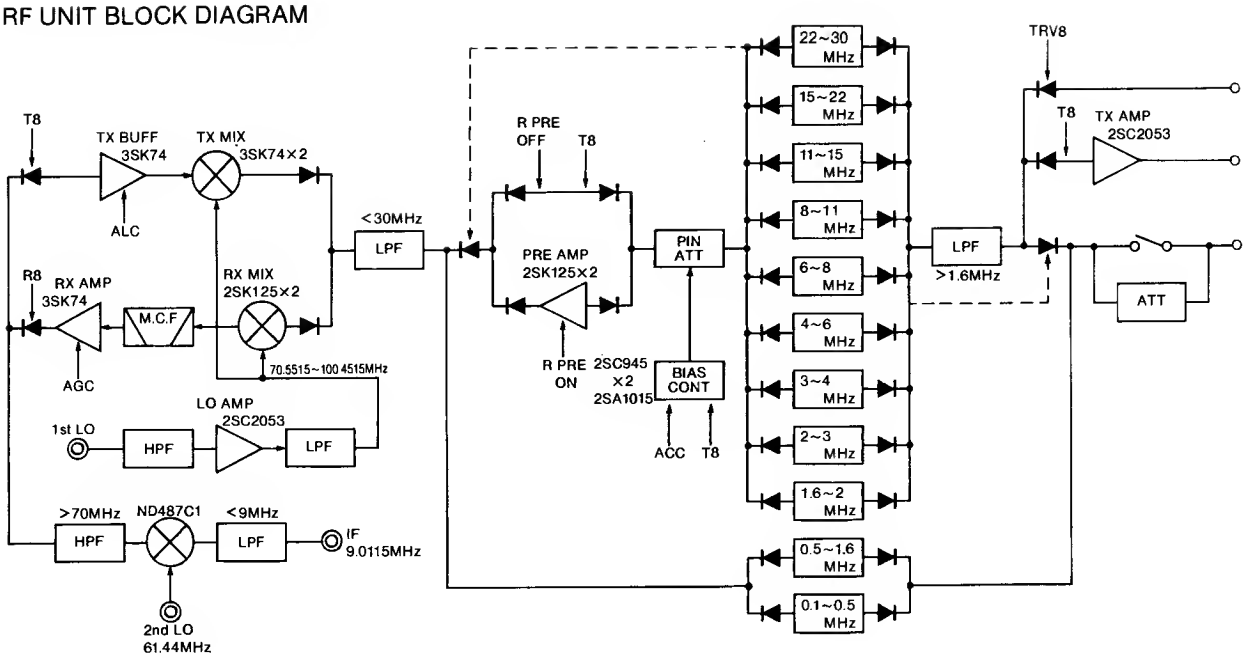


Fig. 6

3. PA UNIT

RF signals input from the RF UNIT through P1 are amplified by Q1, a class A amplifier. Output from Q1 is converted to balanced output by L1 and amplified by Q2 and Q3, class AB push-pull amplifiers. Negative feedback circuits inserted between the collector and base of Q2 and Q3 provide wide frequency characteristics. The idling current of Q2 and Q3 is controlled by the junction voltage of D1. The current is set at about 100mA by R27. R30 prevents the adjustment point from deviating due to variations in the characteristics of D1.

Output from Q2 and Q3 is fed into the impedance matching section of L4 and is amplified by Q4 and Q5, class AB push-pull amplifiers which provide 100W output power.

A portion of the output power from Q4 and Q5 is applied to the bases of these transistors through a negative feedback transformer (L9) which provides stability and broadband characteristics in the frequency range 1.8~30MHz. R23 adjusts the idling current to approximately 600mA.

Output from Q4 and Q5 is then fed to L10 for impedance conversion and output to the FILTER UNIT from P2.

4. FILTER, CONNECTOR UNITS

RF output from the PA UNIT is fed into J1 on the FILTER UNIT to eliminate harmonic components. Filtered output signals pass through the SWR detecting transformer (L18) to the CONNECTOR UNIT via P2.

The forward wave component detected by L18 is rectified by D1, filtered by C38, divided by R2 and R4, and fed into J7 on the MAIN UNIT. A reflected wave component is also detected by L18 and is rectified by D2, processed by C39, R3, and R5, and is finally sent to the MAIN UNIT.

RF output fed to the CONNECTOR UNIT passes through a diode switch (D4) to the ANTENNA CONNECTOR.

4 - 2 - 10 PBT OSCILLATOR CIRCUIT

This oscillator circuit oscillates local frequency signals for mixers IC10 and IC11 which are located at both the input and output terminals of the 455kHz filter. In the receive mode, the local signal frequency is changed by the [PBT] CONTROL and the center frequency of the 455kHz filter is changed likewise. Therefore, passband tuning functions with a 9MHz filter.

In AM and FM modes, the center frequency of the 9MHz filter is 9.0100MHz. In CW and RTTY-Narrow modes, the center frequency is 9.0106MHz. In SSB mode the center frequency is 9.0115MHz. Oscillator frequency variation causes frequency differences between SSB and the other modes.

Oscillator frequency is changed by X7, L36, and varactor diode D126 which is connected to X7 in series. The voltage from the [PBT] CONTROL is between 0 and 8V and the voltage passes to the cathode of D126 through Q58, R332, and R336. −5V are applied to the anode of D126.

The oscillator frequency of this circuit is 9.4665MHz at the center position of the [PBT] CONTROL. The frequency varies up to ±1.7kHz with [PBT] CONTROL rotation. In AM, FM, CW, and RTTY-Narrow modes, R333 and R334 are added to the oscillator circuit by Q56 and Q57. The oscillation frequency for each mode is shifted to 9.4650MHz or 9.4656MHz. In transmit mode the oscillator frequency is fixed by applying a voltage via R337 and D129.

4 - 2 - 11 CW SIDETONE CIRCUIT

The CW sidetone circuit consists mainly of Q72 and employs a phase shift oscillator and oscillator frequency of approximately 700Hz. This oscillation is controlled by control voltage from the CW keying circuit through D152. Output signals in this circuit are fed into a monitor preamplifier circuit.

4 - 2 - 12 MONITOR CIRCUIT

The transmitter monitor circuit is not simply a modulation monitor: it also receives signals at the point where ALC is applied, allowing accurate monitoring. After a portion of the transmitting signal is amplified by Q49, it is detected by IC15 and fed into IC19(a), the monitor preamplifier. The monitor circuit is turned ON and OFF by the power source of Q49.

4 - 2 - 13 MONITOR PREAMPLIFIER CIRCUIT

IC19(a) controls the monitor preamplifier circuit and amplifies output from the monitor circuit, CW sidetone circuit, and EX-310, an optional voice synthesizer unit. Output from IC19(a) is applied to IC18, the AF power amplifier, through the [AF GAIN] CONTROL. Monitor gain can be controlled by the [MONITOR] SWITCH on the top panel of the transceiver.

4 - 2 - 14 ALC CIRCUIT

Detected forward voltage from the SWR detector circuit is fed into the negative (−) input of IC5(c). The positive (+) input of IC5(c) receives the reference voltage, so when the forward voltage is higher than the reference voltage, output from IC5(c) is at a negative voltage level. The resulting gain of Q1 on the MAIN UNIT and Q11 on the RF UNIT will be reduced. The reference voltage for IC5(c) is controlled by the [RF POWER] CONTROL to keep peak power continuously between 10 and 100W.

The time constant of the ALC is for fast attack except in AM mode. Slow release occurs in SSB and CW modes and fast release occurs in FM and RTTY modes. The fast release time is fixed by C43 and R70. In FM or RTTY modes, R67 combines with Q18 and Q19 to create slow release times. In AM mode, the time constant is made by Q16 and Q17 to make an average ALC. If an external linear amplifier is used, Q82 controls the ALC line and the input voltage level is 0~ −2V.

4 - 2 - 15 APC CIRCUIT

The APC circuit will operate when the antenna impedance is high or when an excessive amount of current flows through the final transistor. Output from IC6(e) (the SWR METER amplifier) or IC6(f) (the IC METER circuit) is applied to the negative (−) input of IC4(b). The positive (+) input receives the reference voltage which is fixed by R75 and R76. The resulting output from IC4(d) controls the output power. The input voltage is adjusted by R95 (SWR) and R99 (Transistor current).

4 - 2 - 16 TRANSMITTER METER CIRCUITS

(a) Po METER:
Detected forward voltage from the SWR detector circuit is amplified at IC5(d) and is then applied to the Po METER. D51 and C50 are connected to the output of IC5(d), creating peak conditions on the voltmeter.

(b) SWR METER:
Detected reflection voltage from the SWR detector circuit is amplified at IC6(e) and is then applied to the SWR METER.

(c) ALC METER:
This meter indicates the ALC level. The ALC circuit begins to function when the RF output power reaches a preset level. The detected ALC voltage is applied to operational amplifier IC4(a) for amplification and the ALC METER indicates the output voltage.

(d) Ic METER:
This meter indicates the collector current of the final transistors in the PA UNIT. A very low resistance resistor is connected in the 13.8V line of the PA UNIT in series. This resistor creates voltage when the collector current is flowing. The voltage between both leads of the resistor is applied to a DC differential amplifier IC6(f) for indicating the Ic METER current level.

(e) Vc METER:
This meter indicates the power supply voltage. The power supply voltage is divided by resistors on the FRONT UNIT and a portion of the divided voltage creates the Vc indicator. R106 on the MAIN UNIT is for voltage indicator calibrations.

(f) COMP METER:
This meter indicates the compression level when the speech compressor is in use.

4 - 2 - 17 VOX AND ANTI-VOX CIRCUITS

A portion of output signals from the mic amplifier in the FRONT UNIT passes through the [VOX] GAIN CONTROL and is applied to the VOX circuit on the MAIN UNIT. Input audio signals are applied to a comparator IC chip, IC16(a), through a variable attenuator for anti-vox control. This attenuator consists of R340, R341, Q59, and amplifier Q60. The comparator outputs 8V normally and Q61 is turned OFF.

When an audio signal is applied to the comparator and the peak of the audio signal is over the threshold level, the comparator output voltage decreases. Therefore, Q61 is turned ON and C227, C228 and C229 are charged so that the SEND line is grounded, creating the transmit mode via Q62 and Q63.

The charged voltage of Q61 is discharged by the [VOX DELAY] CONTROL on the front panel through R355. The transceiver then returns to receive mode. Delay time of the VOX operation is adjusted by the [VOX DELAY] CONTROL.

In CW mode, a voltage from the keying circuit is charged into C227 and C228 and the VOX circuit has the same function as described above. However, the voltage is not charged in C297 since D133 is connected to the collector of Q61. The delay time in CW mode is therefore shorter than in the other modes. Also, C228 is separated from the circuit so that the [VOX DELAY] CONTROL is set for a minimum value and the delay time is negligible when operating with CW full break-in.

The ANTI-VOX circuit prevents the VOX circuit from malfunctioning due to noise from the speaker. A portion of

the speaker output signal is applied to IC16(b) through the [ANTI-VOX] CONTROL on the top panel. Amplified signals from IC16(b) are rectified by D131 and pass into variable attenuator Q59. The [ANTI VOX] CONTROL thus depends on output from the speaker to control the VOX circuit. In CW and RTTY modes, input signals from the VOX circuit are cut by Q59 and the VOX function does not work with microphone input signals.

4 - 2 - 18 METER SWITCHING CIRCUIT

The front panel meter is a multifunction meter so it has the capability of indicating several transceiver meter measurements. Meter functions are changed through use of a CMOS analog switching IC chip (ICS).

The signal output from each detector in transmit mode is applied to the [METER] SWITCH on the front panel. The [METER] SWITCH selects the desired information and the selected signal passes to IC8(c) on the MAIN UNIT.

The signal output from each detector in receive mode has two different signal lines. In FM mode, IC8(a) cuts the signal strength signal for modes other than FM and selects the FMS line for FM signal strength signals.

IC8(a) and IC8(b) are used for receiving. IC8(c) is used for transmitting.

4 - 2 - 19 FILTER SWITCHING CIRCUIT

The filter selector circuit consists of a CMOS four channel multiplexer, IC3. The signals for each mode and for the [FILTER] SWITCH positions (IN or OUT) on the front panel are applied to input terminals A to C on IC3. Output terminals 0 to 7 output a signal which accords with input signal combinations. The output signal is divided into four different lines such as three 9MHz filter lines and a 455kHz filter line.

In FM mode, signals pass through FI6, a 455kHz filter. The switching circuit selects FI6 only, so signals will not pass through any 9MHz filters used for signals in other modes. Refer to the FILTER COMBINATION table in SECTION 11-5 for further information.

The [FILTER] SWITCH on the front panel of the IC-751A selects two receive filter systems for SSB, CW, RTTY or AM modes when it is placed in the IN or OUT positions. The IN/OUT relationship of the [FILTER] SWITCH may be reversed by using the internal FILTER REVERSE SWITCHES, S3 AND S4. Refer to SECTION 11-1 OPTIONAL FILTERS for further details.

4 - 3 POWER SUPPLY CIRCUITS

4 - 3 - 1 8V REGULATOR CIRCUIT

This circuit supplies regulated 8V signals both in receiving and transmitting. These 8V signals are generated by a three-terminal voltage regulator IC chip (IC17) on the MAIN UNIT after they pass from the METER SW UNIT as 13.8V signals.

TIMING CHART FOR FULL BREAK-IN OPERATION

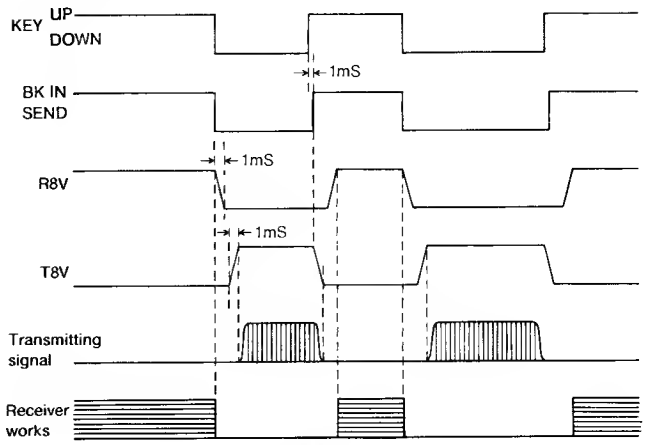


Fig. 7

4 - 3 - 2 RECEIVE 8V (R8V) REGULATOR CIRCUIT

This circuit supplies R8V in receive mode, and consists of Q65, Q66 and Q67. Q65 is used for regulating the voltage. Q65 and Q67 prevent R8V from being supplied in transmit mode.

4 - 3 - 3 TRANSMIT 8V (T8V) REGULATOR CIRCUIT

This circuit supplies T8V in transmit mode, and consists of Q68, Q69 and Q70. Q68 is used for regulating the voltage. Q69 and Q70 prevent T8V from being supplied in receive mode.

4 - 3 - 4 POWER SUPPLY SWITCHING CIRCUIT

Switching of the regulated power supply voltage between receive and transmit mode is performed by an interface circuit consisting of Q64, Q68 and Q69. The interface circuit is connected to the SEND line. When the SEND line voltage is more than 2V as detected by Q64, the R8V regulator circuit functions; when the line voltage is between −0.3 and +0.8V, the T8V regulator circuit functions.

Regulator switching timing chart

4 - 3 - 5 REGULATOR SWITCHING TIMING CIRCUIT

This circuit gives the PLL circuit a faster lockup time when the [RIT] or [ΔTX] SWITCHES are turned ON.

Either R8V or T8V is applied to Q71 through D139 and D140. When both R8V and T8V are 0V at the moment when the receive mode is switched to transmit mode or vise versa, the collector of Q71 is "HIGH" and the level is applied to the MUTE circuit on the PLL UNIT.

4 - 4 PLL CIRCUITS

The PLL UNIT in the IC-751A is equipped with a reversed heterodyne 1st mixer and a normal heterodyne 2nd mixer, so PLL output has very accurate oscillation.

The PLL UNIT outputs two oscillator signals for the RF UNIT: a variable first local oscillator output (1st LO output) of 70.55~100.45MHz necessary for the 1st mixer, and a fixed local oscillator output (2nd LO output) of 61.44MHz necessary for the 2nd mixer. A marker signal is also generated in this unit and is sent to the RF UNIT.

All the signals generated in the PLL UNIT are produced from a single oscillator output. Therefore, the frequencies of all signals generated in the PLL UNIT can be calibrated simply by adjusting the reference frequency oscillator.

4 - 4 - 1 REFERENCE FREQUENCY OSCILLATOR AND MARKER CIRCUITS

The frequency of reference frequency oscillator Q10 is the base of all the frequencies of the signals in the PLL UNIT so it requires sufficient stability. Therefore, C3, C6, and C8 are provided for temperature compensation, and a regulator output voltage of 8V is further obtained from D20, a 5V zener diode.

The frequency of the reference frequency oscillator is 30.72MHz. This frequency is used for the 2nd LO circuit and for reference frequency signals for the main and sub loops, and in-loop LO oscillator.

In order to supply the 2nd LO output, the reference frequency oscillator output is doubled and amplified by Q14. Spurious components are sufficiently reduced by L3, L4 and

PLL SUB-LOOP BLOCK DIAGRAM

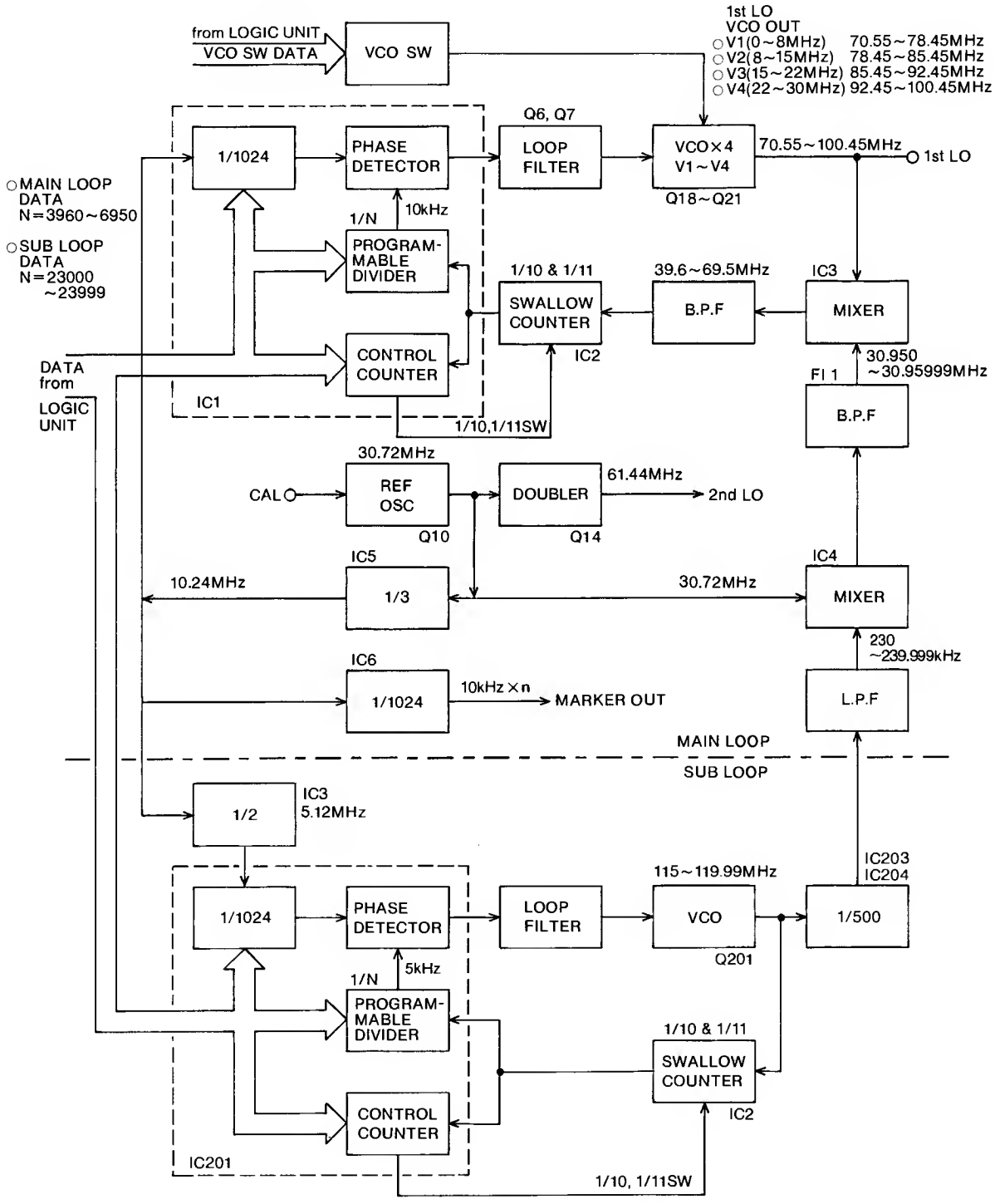


Fig. 8

L5. An output signal of about 3dBm/50Ω is fed to the RF UNIT from J5. A mute signal is applied to this stage when the PLL is unlocked.

In order to obtain a reference signal of 10kHz for the main loop, IC5 divides the reference frequency oscillator signal by three and applies a 10.24MHz signal to IC1. For a sub-loop reference signal of 5kHz, IC203 divides the output signal of IC5 by two and applies a 5.12MHz signal to IC201.

For the marker signal, a 10kHz signal is generated by dividing the IC5 output signal of 10.24MHz by 1024 in IC6. Its harmonics are fed through buffer amplifier Q12 and fed to the RF UNIT through P1. Since the marker signal is derived from reference frequency common to all the frequencies in the PLL UNIT, all the frequencies are adjusted simultaneously when the marker frequency is calibrated with a standard frequency signal such as JJY or WWV.

4 - 4 - 2 MAIN LOOP CIRCUITS

The main loop forms the PLL loop and supplies the 1st LO output. It consists of a combination of a mixed down and divided system.

The VCO output frequency Fv is given as:

$Fv = F_{LO} + N \times Fref$

Frequency changes are made by changing the F_{LO} and N.

The reference frequency (Fref) is 10kHz, and the VCO is controlled in 10kHz steps by changing the dividing ratio N of the programmable divider. A frequency between this step (less than 10 kHz) is obtained by F_{LO} which controls the VCO output frequency. Note that F_{LO} can be changed in 10Hz steps over the 9.99kHz range, and in this way the entire 30MHz range of the PLL can be varied in 10Hz steps.

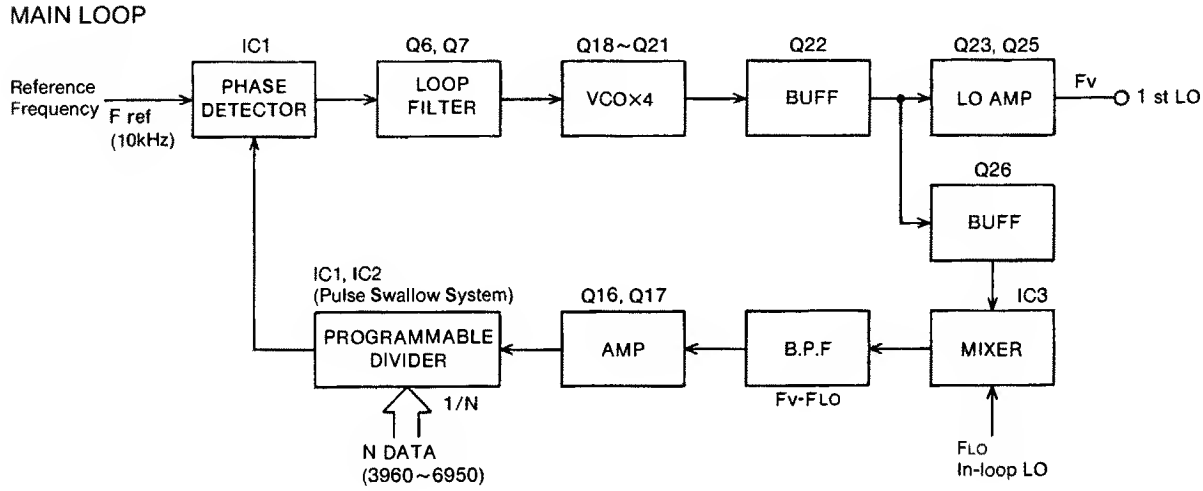


Fig. 9

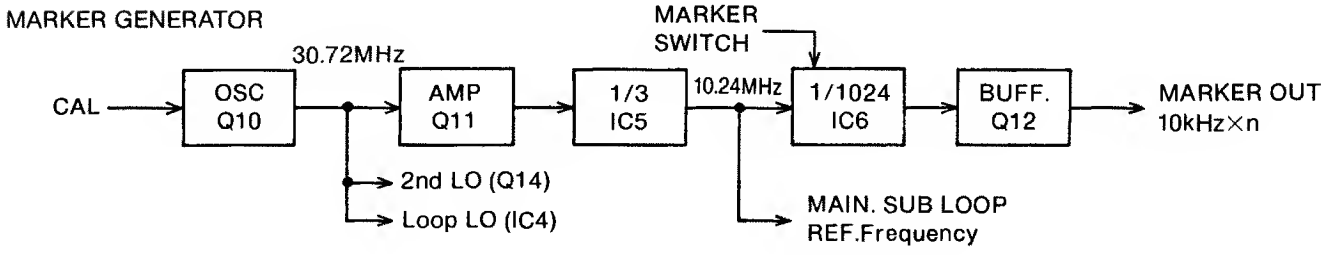


Fig. 10

(a) PLL IC

IC1 (M54929P) is a multi-function IC containing a phase comparator, a programmable divider, a reference frequency oscillator circuit, a divider, and a swallow counter controller. By using this IC with IC2 (M54466L, a swallow counter), it performs pulse swallow dividing. This combination forms a programmable divider which features a large dividing ratio and allows operation even in a higher frequency range. Compared to conventional ICs fewer components are required and the combination allows the PLL to be locked in steps as small as 10Hz.

(b) VCO

The performance of the VCO is very important for PLL operation. A high carrier-to-noise (C/N) ratio and a stable oscillator output is obtained in the IC-751A by using four separate VCOs, each of which is assigned a quarter of the necessary bandwidth. Dividing the VCOs reduces the burden of one VCO which would otherwise provide frequency changes over the entire bandwidth.

Power supply to the VCOs is doubly regulated as with the reference frequency oscillator. Furthermore, coreless coils are used for the oscillation coils in order to obtain a high Q as well as immunity from external induction.

The location of grounding points on the printed circuit board, allocation of components, and utilization of a solid shielding case additionally give the transceiver a high C/N ratio.

(c) LOOP SYSTEM

The output of the VCO is separated into two parts after passing through buffer amplifier Q22.

One part is amplified by Q23, and is output to the RF UNIT as a 1st LO output after impedance matching by Q25. The output level is about 0dBm/50Ω.

The other part is fed back to the PLL loop through buffer amplifier Q26. A common base amplifier circuit with a high isolation performance is used for the buffer amplifier in order to prevent spurious components from leaking into the 1st LO output. Spurious components arise from various frequency components in the PLL loop. The VCO signal is then mixed with the in-loop LO (F_{LO}) by IC3 and mixed down. Output from the mixer passes through a bandpass filter with a bandwidth of 35~75MHz, eliminating spurious components. The output is then amplified by cascade amplifiers Q16 and Q17, and is input to IC2 to form the PLL. D10 and D11 help limit excessive input voltages to IC2.

(d) IN-LOOP LOCAL OSCILLATOR CIRCUIT

The in-loop local oscillator controls the main loop in 10Hz steps by heterodyning the VCO signal.

Output frequency from the sub-loop is too low to use (230.00~239.99kHz) so the output is mixed with the reference frequency oscillator output via IC4 and converted to an appropriate frequency through heterodyning.

Heterodyned output passes through monolithic filter FI1 where spurious components are removed. The output is then amplified by Q15 and fed to IC3.

IN-LOOP LOCAL OSCILLATOR BLOCK DIAGRAM

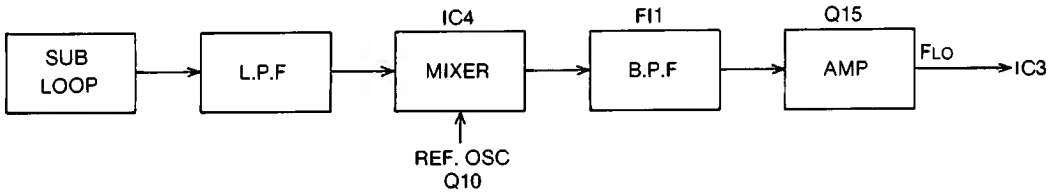


Fig. 11

(e) LOOP FILTER AND MUTE CIRCUITS

The loop filter of the main loop uses an active filter composed of Q6 and Q7. The loop filter and the VCO are important for the performance of the PLL circuits, and determines lockup time and C/N (Carrier/Noise) ratios.

Lockup time and C/N ratios conflict with each other. That is, as the time constant of the loop filter increases lockup time speed, the C/N ratio will be decreased. In order to solve this problem a variable resistor composed of an FET is inserted into the loop filter in the PLL circuits. Thus, if the frequency changes, the lockup time increases speed, decreasing the time constant of the loop filter, and making the C/N ratio greater by setting the time constant at a higher level than for normal operations.

The circuit changing the time constant Q5 is driven by a mute signal. If the mute signal is generated by the main loop or the sub loop, or if the frequency is changed to more than a certain level at one time, the circuit starts operating.

Mute signals output from IC1 in the main loop or IC201 in the sub loop are processed by Q8 and Q9. They are given appropriate voltages and a time constant, and are fed to Q5, Q13, and Q24. Q13 and Q24 switch the bases of the transistors of the output amplifier for 1st LO and 2nd LO output. This switching operation allows the transceiver to transmit or receive on desired frequencies, and completes lockup time operations more quickly.

4 - 4 - 3 SUB-LOOP

This loop forms a locked loop using a divider to provide in-loop LO for the main loop.

The reference frequency is 5kHz and the VCO can be locked within the frequency range of 115.00~119.995MHz. The output signal of the 4.995MHz bandwidth with a 5kHz resolution is divided in a 1/500 ratio by IC204 and IC203, providing output ranging from 230.00 to 239.99kHz (i.e., 9.99kHz bandwidth) in 10Hz steps. This output is fed to the main loop.

VCO output is input to IC202 as well as to IC204 and passes through a loop filter composed of IC201 to control the VCO and form a PLL circuit. A pulse swallow counter composed of the combination of IC201 and IC202, as in the main loop, is used in this loop. Therefore the frequency can be changed by changing the dividing ratio. A 10.24MHz reference frequency is divided by 2 in IC203 and then is divided by the built-in divider of IC201 at 5kHz.

SUB-LOOP BLOCK DIAGRAM

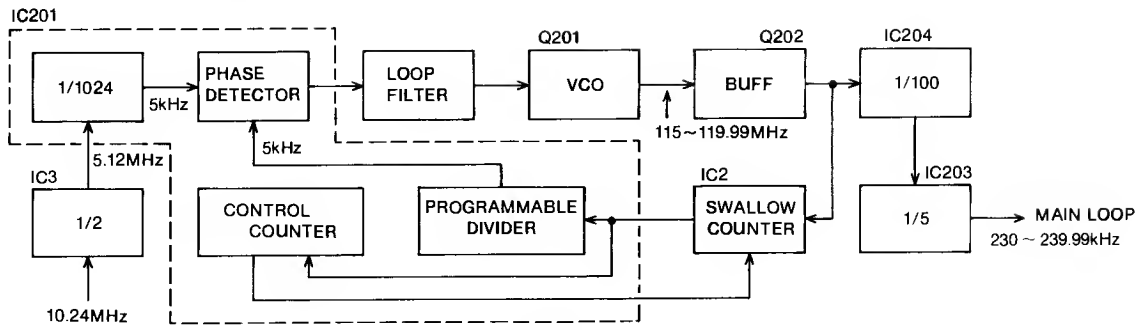


Fig. 12

4 - 4 - 4 PLL DATA

Data for setting the dividing ratio N of the programmable divider is sent from the LOGIC UNIT. Control data for switching VCOs is also sent from the LOGIC UNIT. Data to set the dividing ratio (called N-data) is sent dynamically while data for the VCO is sent statically.

Since the dividing ratio of the reference frequency divider of IC1 can be changed, the data (1/1024 constant) is also sent at the same time.

(a) HOW TO DERIVE N-DATA

Since there are two locked loops, two kinds of N-data are necessary. Even if the output frequencies from the PLL circuits in all modes are the same, the display frequencies are different depending on the operating mode.For example, if the same frequency is displayed for LSB, AM and FM modes, the frequency will be 600Hz lower in CW and RTTY modes and 3kHz lower in USB mode.

The method for deriving N-data for LSB, AM, and FM modes is shown below.

example : 14.0750MHz

Main Loop

Ignore the digits equal to or lower than 1kHz of the displayed frequency and let the obtained frequency be F1, then:

$$N = F1 \times 100 + 3950$$

where F1 is 14.07 for the case shown above. Thus, we get:

$$N = 14.07 \times 100 + 3950 = 5357$$

Sub-loop

If the frequency shown in the digits is equal to or lower than 1kHz and you let the displayed frequency be F2, then

$$N = F2 \times 100 + 23000$$

where F2 is 5.00 in the case shown above. Thus, we get

$$N = 5.00 \times 100 + 23000 = 23500$$

Note that the digit for 10Hz is not displayed.

To get N for other modes, add 600Hz for CW and RTTY modes and add 3kHz for USB mode to the displayed frequency, then follow the steps shown above.

For the value of N to be derived at in the above way, the dividing ratio of the programmable divider must be 1/N.

4 - 5 LOGIC UNIT

The functions in the LOGIC UNIT include the control of frequency, the processing of BPF and LPF signals and mode signals, and data output for the PLL UNIT and DISPLAY UNIT. The LOGIC UNIT is composed of an 8-bit NMOS CPU, a 4-bit 1k word CMOS RAM, a multi-purpose custom IC, and I/O expander ICs.

4 - 5 - 1 CPU

Functions are assigned to the pins of the CPU as shown below. The interrupt pins are assigned to the TUNING CONTROL with the highest priority. Pins where no functions are assigned are left unconnected.

Addresses are assigned not only to ROM and RAM, but to all the other peripheral devices.

The CPU's port addressing and its memory maps are shown in Fig. 13 and Fig. 14.

4 - 5 - 2 CPU INPUT CONTROL CIRCUIT

A multi-function custom IC (a 40-pin DIL package CMOS IC) is used. (Refer to Fig. 15)

(a) An external L and C are connected to Pin 18 and Pin 19 to give about a 100kHz clock signal.

(b) The ATS of Pin 32 is at a HIGH level if the TUNING CONTROL is rotated at a faster speed than can be set by the values of C6 and R7 connected to TC of Pin 21. The HIGH level is used as a strobe signal which switches the dial-pitch(tuning rate) of the matrix input.

(c) M1 and M2 at Pin 38 and Pin 37 are used to switch the multiplication factors of the input pulses from the TUNING CONTROL. 200 pulses per one rotation are obtained by 50 pulses × 4 (quadri-speed mode). For RIT/ΔTX CONTROL, the multiplication factor is fixed at double to give 50 pulses × 2 = 100 pulses per one rotation.

CUSTOM IC PIN CONNECTION

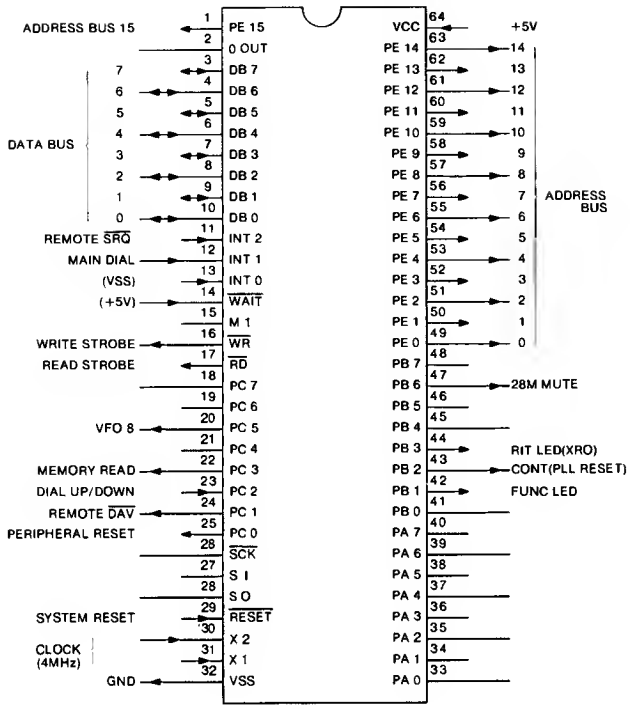


Fig. 13

CPU MEMORY MAP

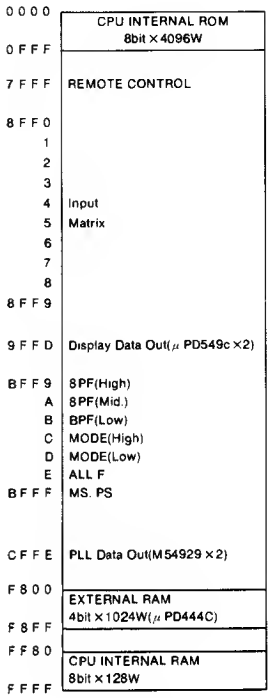


Fig. 14

CPU PIN CONNECTION

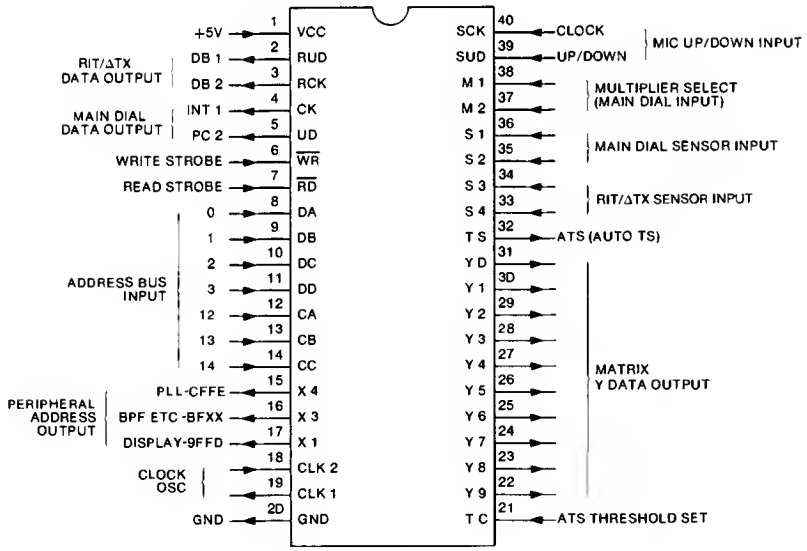


Fig. 15

4 - 5 - 3 I/O EXPANDER CIRCUIT

This circuit controls data outputs for PLL circuits, VCOs, bandpass filters, and modes.

I/O EXPANDER CIRCUIT

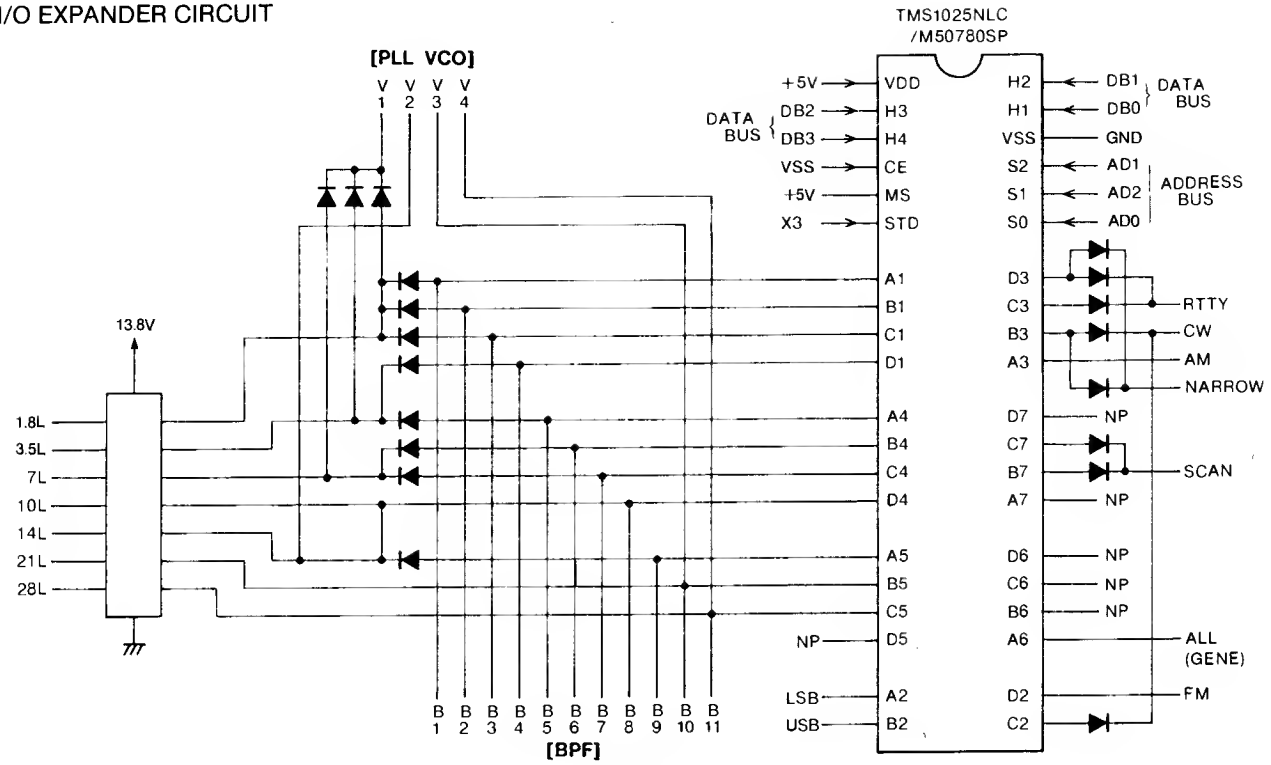


Fig. 16

4 - 5 - 4 N-DATA OF PLL

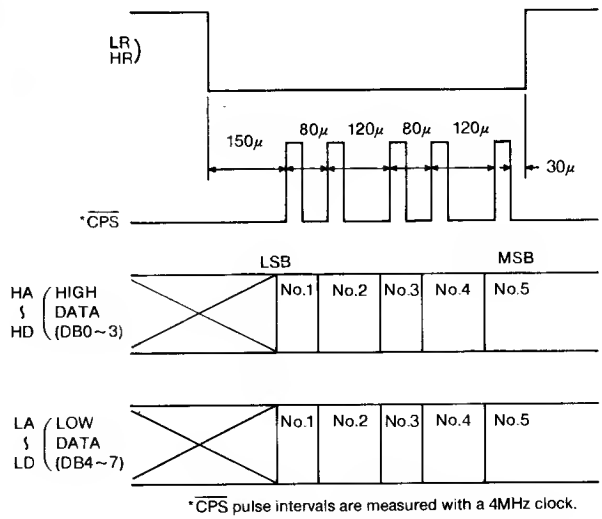
Since the PLL circuits use a double loop construction, both main loop and sub loop N-data are sent from the LOGIC UNIT to the PLL UNIT.

Data lines HA-HD and LA-LD are switched by the gates of IC17 and IC18. The lines are shared by signals for the PLL circuits, DISPLAY circuits, bandpass filters, etc. Therefore, this switching prevents the VCOs in the PLL UNIT from introducing noise when the lines are not used for PLL data.

HIGH and LOW N-DATA Table

HIGH N-DATA X10M, X1M, X100K, X10K		LOW N-DATA X1K, X100Hz, X10Hz	
DISPLAY FREQUENCY	N-DATA	DISPLAY FREQUENCY	N-DATA
0.10MHz	3960	0Hz	23000
0.11MHz	3961	10Hz	23001
0.12MHz	3962	20Hz	23002
0.13MHz	3963	50Hz	23005
0.14MHz	3964	100Hz	23010
0.15MHz	3965	1kHz	23100
1MHz	4060	2kHz	23200
10MHz	4950	3kHz	23300
20MHz	5950	4kHz	23400
30MHz	6950	5kHz	23500
		9.99kHz	23999

N-DATA OUTPUT TIMING DIAGRAM



*$\overline{CPS}$ pulse intervals are measured with a 4MHz clock.

Fig. 17

4 - 5 - 5 MATRIX UNIT

The MATRIX UNIT consists of a matrix board, matrix switch board, and mode switch board. It processes the front panel matrix input and transmit and receive data.

MATRIX TABLE

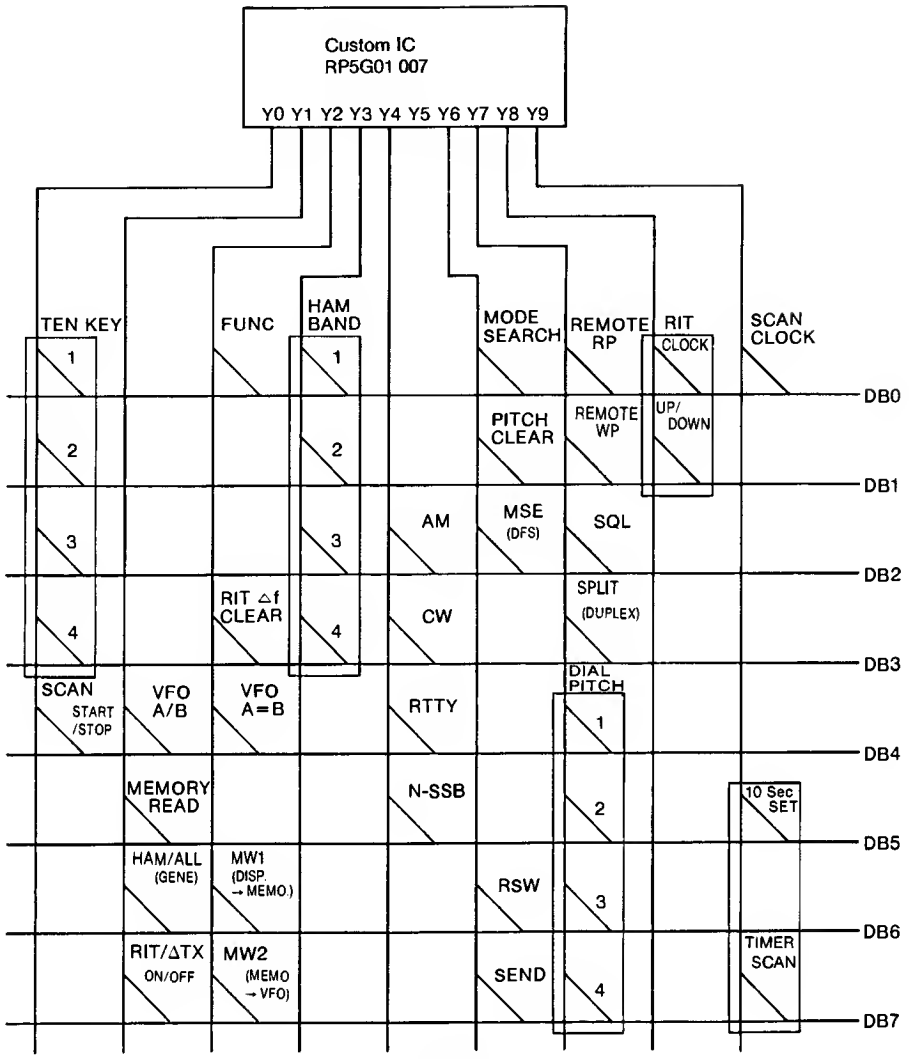


Fig. 18

(1) Y0→DB0-DB3 (TEN KEY)

Following is a matrix for frequency settings and band changing through the use of an external RC-10 ten key unit (optional).

Y0→ / KEY	DB0	DB1	DB2	DB3	BAND	HEX CODE
1	1	0	0	0	1.9	1
2	0	1	0	0	3.5	2
3	1	1	0	0	7	3
4	0	0	1	0	10	4
5	1	0	1	0	14	5
6	0	1	1	0	18	6
7	1	1	1	0	21	7
8	0	0	0	1	24	8
9	1	0	0	1	28	9
0	0	1	0	1	—	A
CE	1	1	0	1	—	B
ENT	0	0	1	1	—	C

(2) Y0→DB4 (SCAN START/STOP)

This matrix starts and stops the scan. It is controlled by the [SCAN] SWITCH and also by the [SQUELCH] CONTROL and the DIAL LOCK SWITCH through IC2(b) and Q3. When the [SCAN] SWITCH is pushed, one pulse signal is input to this matrix to repeatedly start and stop the scan operation.

Three types of scanning operations (MEMORY SCAN, PROGRAMMED SCAN, and SELECTED MODE SCAN) are available. During VFO operation, PROGRAMMED SCAN is automatically selected; during the memory channel operation, MEMORY SCAN is selected. R14 on the LOGIC UNIT adjusts the scanning speed. S10 reactivates the scan if it is interrupted when the squelch is open.

(3) Y1→DB4 (VFO A/B)

This matrix selects VFO A or VFO B via the [VFO] SWITCH. When VFO B is selected, pin 20 of the CPU becomes HIGH. Operation mode, frequency, and ham/general selections are stored independently in each mode.

(4) Y1 → DB5 (MEMORY READ)

This matrix selects a VFO mode or memory channel mode when it is switched by the [VFO/M] SWITCH. Pin 22 of the CPU is HIGH when the memory channel mode is selected. There are 32 memory channels available for storage of mode, frequency, and ham/general data.

(5) Y1 → DB6 (HAM/GENERAL)

This matrix selects the ham band mode or general coverage mode via the [HAM/GENE] SWITCH.

(6) Y1 → DB7 (RIT ON/OFF)

This matrix turns ON and OFF the receive circuit via the [RIT/ΔTX] SWITCH. The binary counter IC1(b), IC1(a) outputs receive signals from pins 13 and 1 respectively when the [RIT/ΔTX] SWITCH is turned ON.

Output signals pass through the OR gate of R13 and D15 and are fed to a one-shot circuit consisting of IC4(b), R14, and C5. This circuit outputs a pulse signal to Q8 which turns ON the RIT matrix (Y1→DB7). The XRO output from pin 44 then becomes HIGH and turns on the receive circuit. When no receive input signal is applied, XRO outputs no signal to turn ON the reset circuit (which consists of IC3(c), IC4(c), D14, R3, and C1). Thus the receive circuit is turned OFF by IC1(b), IC1(a).

Digital transistors Q4 and Q5 turn ON and OFF the receive and transmit indicators on the DISPLAY UNIT. When both pin 1 (ΔTX) and pin 13 (RIT) of IC1 are OFF and the RIT setting of the CPU is ON, the matrix reset circuit (consisting of IC3(c), IC3(d), IC5(c), IC3(a) and IC3(b)) drives IC4(b) which switches the CPU RIT matrix ON and OFF, matching the condition of the CPU and the front panel display. The RIT matrix is turned ON and OFF by the multi-vibrator of IC3(a) and IC3(b).

(7) Y2 → DB0 (FUNCTION)

This matrix selects a function by combining switches as shown in the following table.

COMBINATIONS	FUNCTION
FUNC + A M	Selects FM mode.
FUNC + C W	Selects CW-NARROW mode.
FUNC + RTTY	Selects RTTY-NARROW mode.
FUNC + SSB	Selects reverse side band. (LSB or USB).
FUNC + A=B	Selects VFO transfer direction. (A → B or B → A)
FUNC + CLEAR	Adds RIT/ΔTX Δf to display frequency.
FUNC + WRITE FUNC + M ▶ VFO	Clears (blanks) the displayed memory channel frequency.

(8) Y2 → DB3 (RIT/ΔTX CLEAR)

This matrix clears the receive/transmit shift frequency. When combined with the [FUNCTION] SWITCH, the shift frequency is added to or subtracted from the displayed frequency.

(9) Y2 → DB4(VFO A = B)

This matrix transfers the frequency of VFO A to VFO B. When combined with the [FUNCTION] SWITCH the original VFO is reversed. See table on p. 4-17.

RIT/ΔTX CIRCUIT

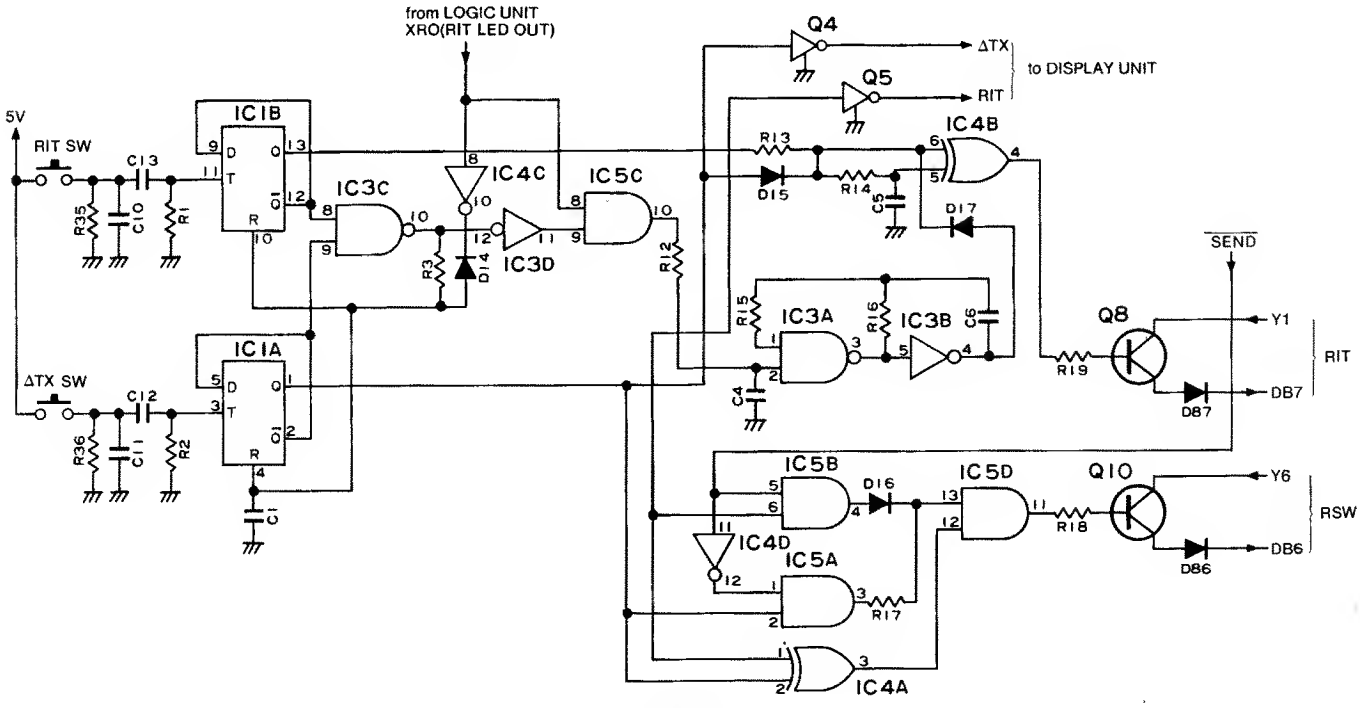


Fig. 19

SWITCH CONDITION	A = B
VFO A is in use.	VFO A → VFO B
VFO B is in use.	VFO B → VFO A

(10) Y2 → DB6-DB7
(DISPLAY → MEMORY/MEMORY → VFO)

This matrix is for memory write and the memory data transfer by the [WRITE] and [M▶VFO] SWITCHES. When combined with the [FUNCTION] SWITCH the data in the displayed memory channel is cleared and the channel is blanked.

SWITCH CONDITION	PUSH	FUNCTION
VFO A or VFO B is in use	WRITE	Transfers the VFO frequency to the selected memory channel.
	M ▶ VFO	Transfers the selected memory channel frequency to the VFO.
MEMORY CHANNEL MODE is in use	WRITE	Transfers the displayed frequency to the selected memory channel.
	M ▶ VFO	Transfers the displayed frequency to the VFO previously used.

(11) Y3 → DB0-DB3 (HAM BAND)

This matrix switches the TUNING CONTROL to a band selected by the [BAND] SWITCH. When the [HAM/GENE] SWITCH is at the [GENE] position the frequency is changed in 1MHz increments.

This matrix selects the operation mode when combined with a mode switch or the [FUNCTION] SWITCH. The display frequency is shifted depending on the selected operation mode as shown in the table below.

BAND (MHz)	INITIALIZED FREQUENCY	DB0	DB1	DB2	DB3
1.9	1,900.0	1	0	0	0
3.5	3,550.0	0	1	0	0
7	7,050.0	1	1	0	0
10	10,050.0	0	0	1	0
14	14,050.0	1	0	1	0
18	18,050.0	0	1	1	0
21	21,050.0	1	1	1	0
24	24,550.0	0	0	0	1
28	28,050.0	1	0	0	1

(12) Y4 → DB2 (AM)

(13) Y4 → DB3 (CW)

(14) Y4 → DB4 (RTTY)

(15) Y4 → DB5 (SSB)

FREQUENCY DIFFERENCES IN VARIOUS MODES

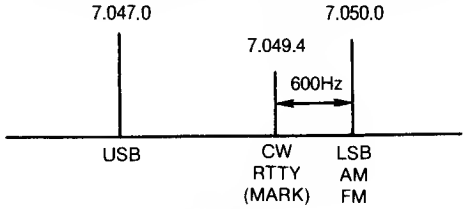


Fig. 20

(16) Y6 → DB0 (MODE SEARCH)

This matrix is for the SELECTED MODE SCAN and is activated by the [MODE-S] SWITCH. Only the memory channels with the desired operation mode are selected in this scan.

(17) Y6 → DB1 (PITCH CLEAR)

This matrix sets the frequency increment to 1kHz in all modes by the [TS] (Tuning Step) SWITCH. When the [TS] SWITCH is ON, the matrix at Y7→DB4 is also turned ON.

(18) Y6 → DB2 (DFS)

This matrix is for dial function selection as set by the [DFS] SWITCH. Refer to the following table.

DFS SWITCH CONDITION	OFF	ON
VFO A or VFO B is in use	Changes displayed frequency	Changes displayed memory channel number
MEMORY CHANNEL MODE	Selects a memory channel (its frequency is displayed)	Changes displayed frequency

(19) Y6 → DB6 (RSW)

This matrix resets RIT data or outputs N-data. IC4(a), IC4(b), IC5(a), IC5(b), IC5(d), R17 and D16 are for the RSW input circuit.

RIT SW	ΔTX SW	T/R	RSW MATRIX	REMARKS
OFF	OFF	RX	OFF	• When RSW MATRIX is OFF, the operating frequency becomes the displayed frequency plus RIT/ΔTX Δf frequency. • When RSW MATRIX is ON, the operating frequency is the displayed frequency.
		TX	OFF	
ON	OFF	RX	OFF	
		TX	ON	
OFF	ON	RX	ON	
		TX	OFF	
ON	ON	RX	OFF	
		TX	OFF	

(20) Y6 → DB7 (SEND)

This matrix is for transmit mode recognition for stopping scanning operations.

(21) Y7 → DB0 (REMOTE RP)

This matrix is for remote-control read pulses.

(22) Y7 → DB1(REMOTE WP)
This matrix is for remote-control write pulses.

(23) Y7 → DB2 (SQL)
This matrix inputs one pulse when the squelch is closed, and controls scanning operations.

(24) Y7 → DB3 (SPLIT/DUPLEX)
This matrix is for split or duplex operation using the VFO A or VFO B SWITCH and the [SPLIT] SWITCH.

(25) Y7 → DB4-DB7 (DIAL PITCH 1-4)
This matrix sets the frequency step tuning rate. The frequency step and the increments per rotation of the TUNING CONTROL in each setting are as follows:

TS	VFO	MEMORY MODE	BAND WIDTH
OFF	10Hz steps (2kHz/1 rotation) By faster rotation 50Hz steps (10kHz/1 rotation)	8CH/1 rotation	HAM: 8 BAND/1 rotation
ON	1kHz steps (200kHz/1 rotation) 100Hz and lower digits will be cleared as "0".		GENE: 8MHz/1 rotation

Y7 → DATA				STEPS and BAND
DB4	DB5	DB6	DB7	
0	0	0	0	10Hz
0	1	1	1	50Hz
1	0	0	0	1kHz
1	0	1	1	BAND

(26) Y8 → DB0-DB1 (RIT: CLOCK, UP/DOWN)
This is a data matrix for RIT which is processed by IC2 on the LOGIC UNIT.

(27) Y9 → DB0 (SCAN CLOCK)
This matrix is for the scan control clock formed by the circuit of Q4, IC7(b), and R14 on the LOGIC UNIT.

(28) Y9 → DB5 and DB7 (10 sec. SET/TIMER SCAN)
This matrix is for setting a 10-second timer which allows the transceiver to resume scanning after stopping. The matrix Y9→DB7 is ON while the timer scan is operating.

4 - 6 DISPLAY UNIT

This unit consists of the display tube and its drivers, and a DC-DC converter section.

DISPLAY UNIT CIRCUIT

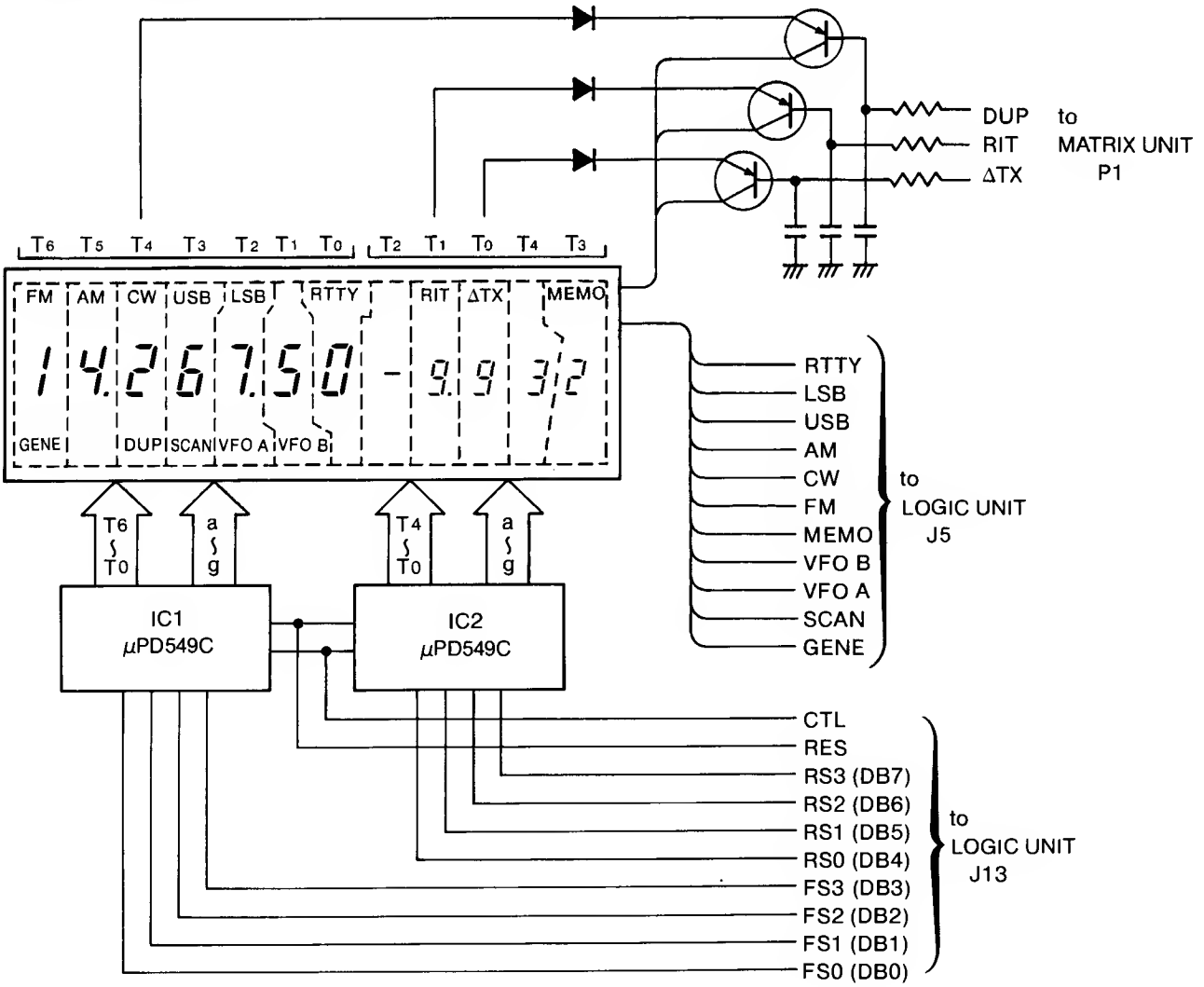


Fig. 21

The display illuminates centralized information of frequency, mode, transmit and receive conditions, memory channel, operating mode (VFO A, VFO B, GENE, DUP, SCAN), etc. The operating conditions of the transceiver can be easily understood because of this centralized display. The display lights up in two colors, red and white, using color filters. LEDs for the transmit and receive indicators and the narrow selection in CW and RTTY modes are also a part of this unit.

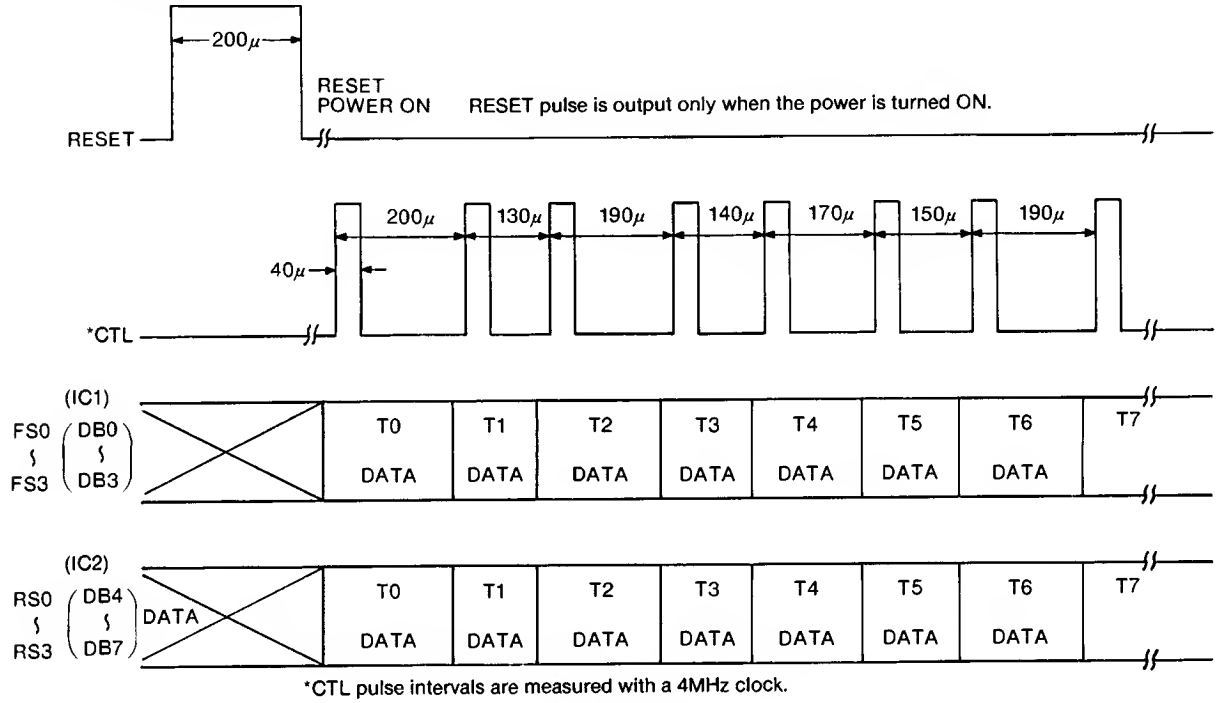
(a) DISPLAY SECTION

DS1, the luminescent display tube, is driven by drivers IC1 and IC2, and lights dynamically. These ICs contain such functions as input data latch, clock oscillator, timing counters, and segment decoders. The clock frequency is set by C2 and C6.

Displays for the receive and transmit shift frequencies and memory channels are driven by IC2. Other displays are driven by IC1.

Signals for the display of RTTY through GENE are sent from the LOGIC UNIT to each segment. These are switched by digit signals T0~T6 from IC1 and T3 from IC2. The transmit, receive, "—", and "DUP" INDICATORS are connected to the same digit in the tube, so each indicator is selected by T4, T1, and T0 digit signals and light up dynamically.

DISPLAY DATA TIMING CHART



*CTL pulse intervals are measured with a 4MHz clock.

Fig. 22

(b) DC-DC CONVERTER SECTION

The +5V voltage source is produced from 13.8V, a voltage regulator.

The DC-DC converter is composed of Q4, Q5, and T1, and generates rectangular pulses of about 15kHz. The pulses are applied to T1 to obtain −5V, −35V, 3.5V AC from the corresponding coils.

Except for 3.5V AC which is provided for the filament of the display tube, all the voltages are rectified for DC voltages. As for −5V, the rectified DC-DC converter output is regulated by IC4 and is supplied to IC1, IC2, and the MAIN UNIT.

Q6~Q8 comprise a circuit which keeps the display OFF for about 2 seconds before the initial reset is completed when the power is turned ON. Immediately after the power is turned ON, Q6 through Q8 are OFF and −35V is not output. When data (CTL) is supplied from the LOGIC UNIT as resetting is completed, Q8 is turned ON, and then Q6 and Q7 are turned ON for −35V output for the display.

Q6, Q7, D19, and R41 form a latch circuit, ensuring that once the circuit is turned ON it will keep providing −35V. R42, C21 and C22 are installed to prevent circuit errors.

4 - 7 OTHER CIRCUITS

4 - 7 - 1 ENC 1 AND ENC 2 UNITS

Pulse signals (SV) from the rotary encoder are fed into transistors QA and QB.

When the T1 SV signal is "LOW", QA and QB are turned OFF and output from QB is "HIGH". When the T2 SV signal is "HIGH" QA and QB are turned ON and output from QB is "LOW".

4 - 7 - 2 RELAY UNIT

The RELAY UNIT is located on the LOGIC UNIT and stops relays on the FILTER UNIT while memory scan is operating. The scan signal appears from pin 29 on IC14 when memory scan is selected. This scan signal turns Q17, Q18 and Q19 OFF. The relays on the FILTER UNIT are controlled by IC15. When Q19 is turned OFF, all the transmit relays are turned OFF and are silent.

4 - 7 - 3 KEYER UNIT

The KEYER UNIT employs an electronic keyer circuit and a cooling fan control circuit.

(a) DOT, DASH INPUTS AND ELECTRONIC KEYER OUTPUT

When IC1 receives a dot signal at pin 1, IC1 outputs a DOT and SPACE (ratio is 1:1). If IC1 receives the next dot signal during output of the first DOT and SPACE, IC1 outputs only the first DOT and SPACE.

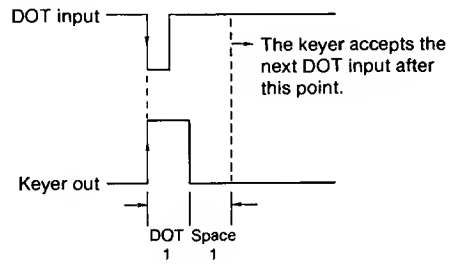


Fig. 23

When IC1 receives a dash signal at pin 2, IC1 outputs a DASH and SPACE (ratio is 1:3). If IC1 receives the next dash signal during output of the first DASH and SPACE, IC1 outputs only the first DASH and SPACE.

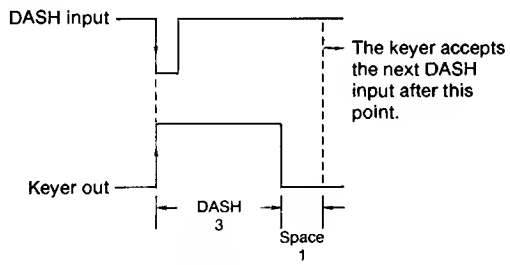


Fig. 24

If IC1 receives a dash signal during a DOT and SPACE output, IC1 outputs a DASH and SPACE after the DOT and DASH output. This is called the DASH MEMORY.

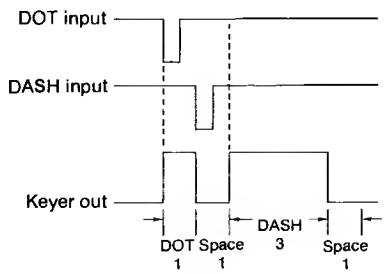


Fig. 25

If IC1 receives a dot signal during a DASH and SPACE output, IC1 outputs a DOT and SPACE after the DASH and SPACE output. This is called the DOT MEMORY.

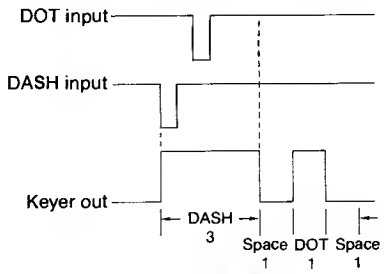


Fig. 26

If IC1 receives the DOT and DASH signal continuously as shown in Fig. 27, IC1 outputs the DOT and DASH alternately. This is called the IAMBIC FUNCTION.

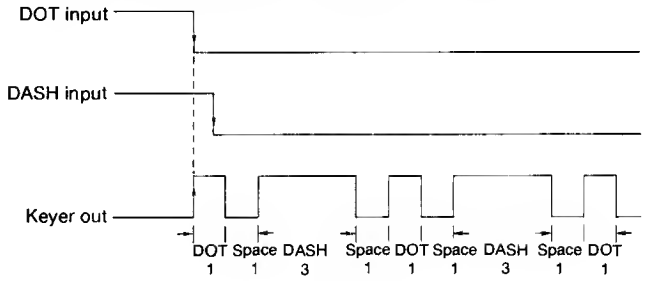


Fig. 27

(b) SPD

These terminals determine the speed of the DOT, SPACE and DASH.

(c) WEIGHT

These terminals determine the ratio of the DOT, SPACE, AND DASH (DOT: SPACE: DASH).

(d) FAN MOTOR CONTROL

Thermal switches S1 and S2 detect the temperature of output from Q4 and Q5 on the PA UNIT and control the cooling fan while decreasing output power.

If the temperature of the transceiver increases in transmit mode, S2 turns ON (at about 50° C) and the cooling fan starts to rotate. The fan continues to rotate even after receive mode is switched to, and will continue until the temperature drops below 50° C. Fan rotation is somewhat slower in receive mode than in transmit mode.

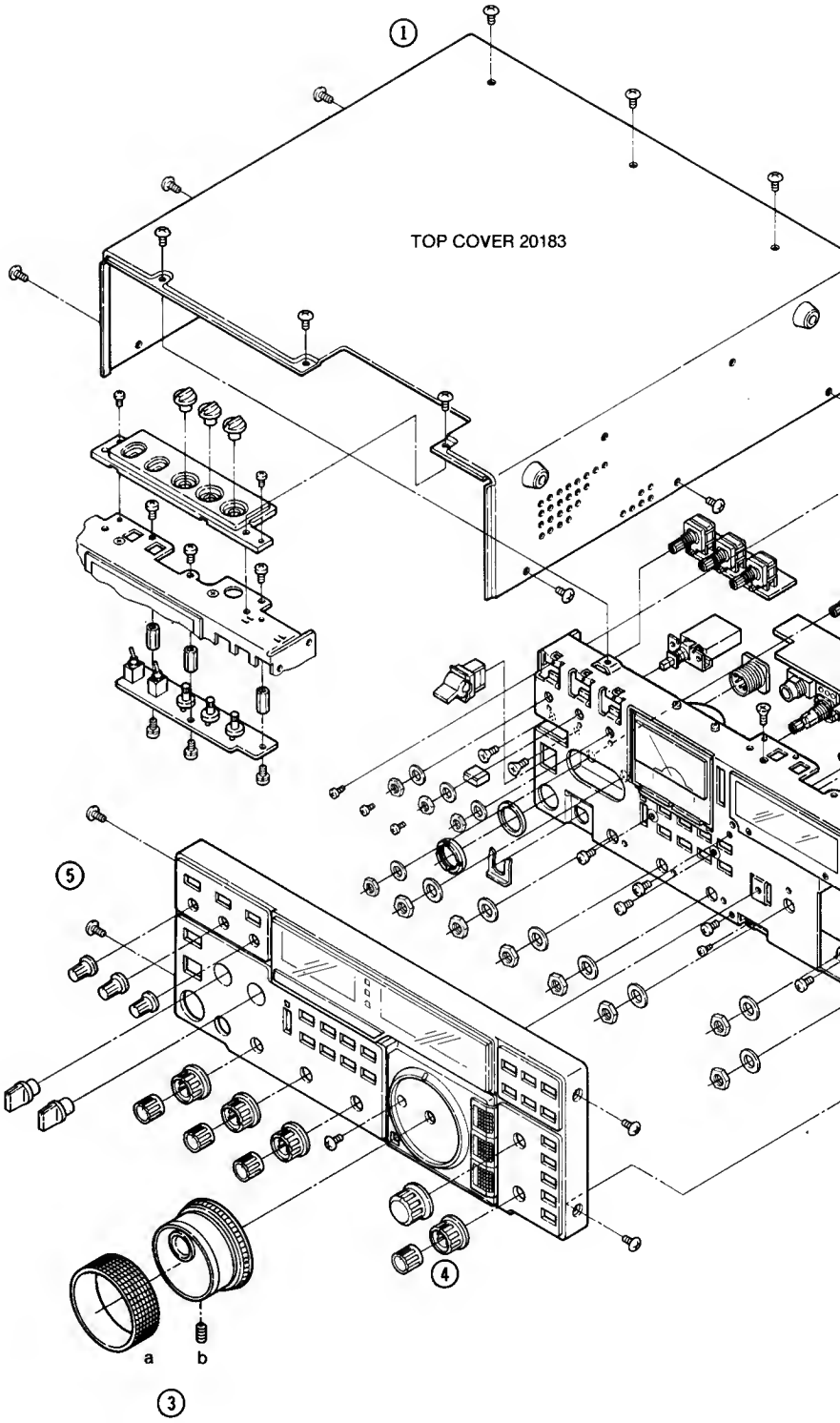
S1 turns ON if the temperature increases to about 90° C or more due to antenna mismatching or other problems. The rotation speed of the fan increases when S1 turns ON.

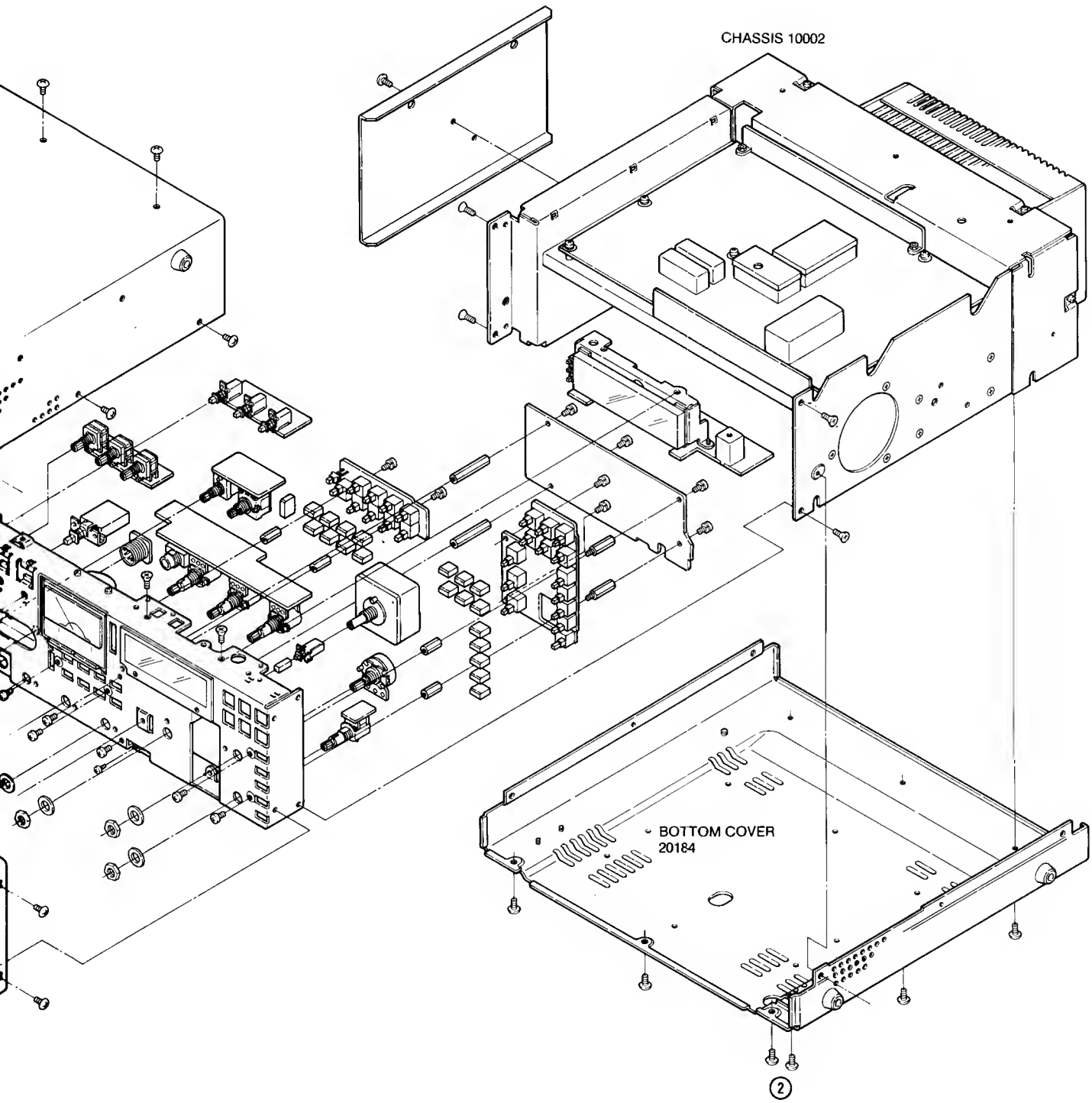
TEMPERATURE (°C)		~ 50	50 ~ 90	90 ~
THERMAL SWITCH	S1	OFF	OFF	ON
	S2	OFF	ON	ON
COOLING FAN SPEED	RECEIVE	OFF	SLOW	MED.
	TRANSMIT	OFF	MED. HIGH	HIGH

SECTION 5 DISASSEMBLY AND ASSEMBLY DIAGRAMS

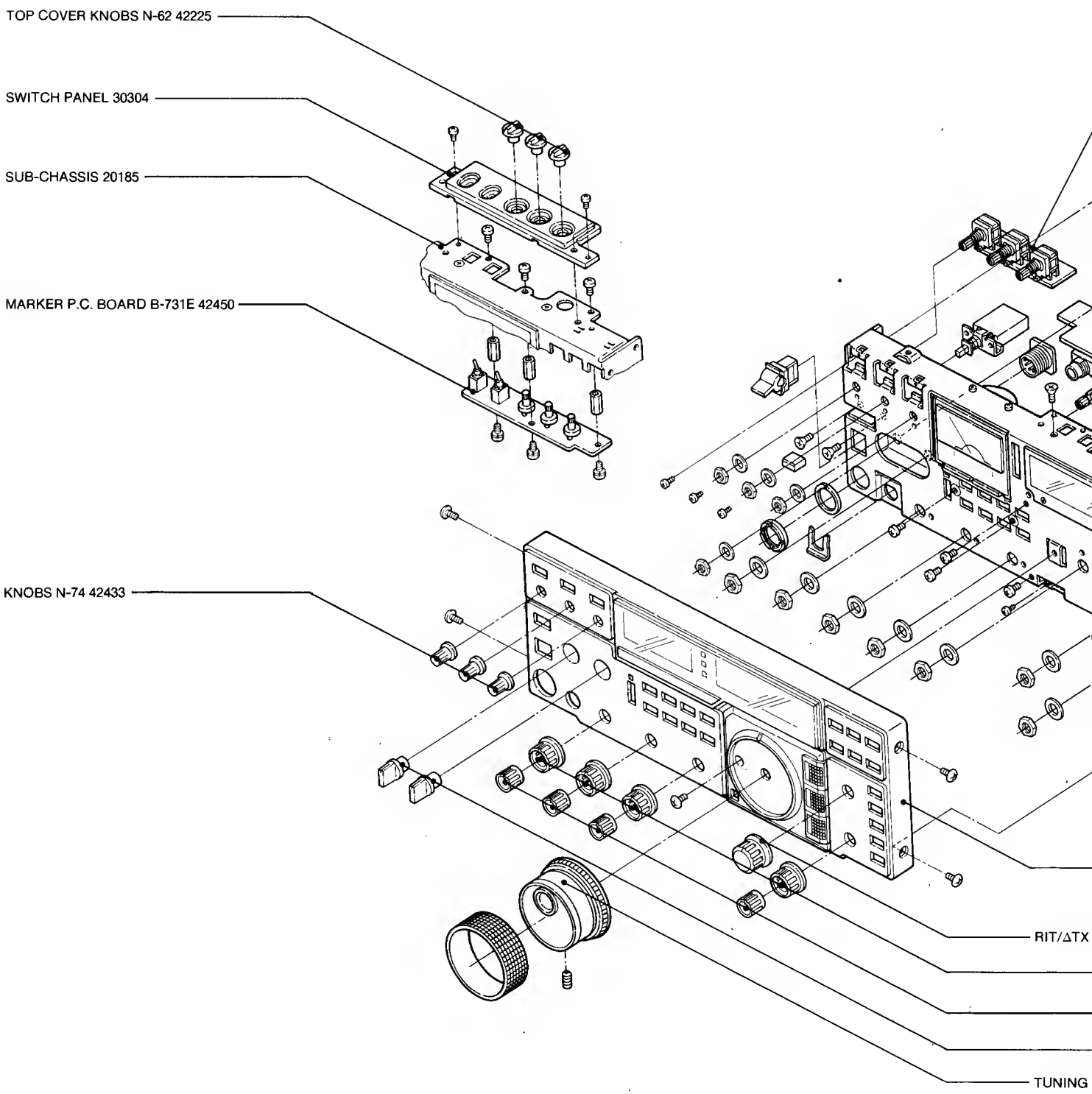
5 - 1 FRAME DISASSEMBLY

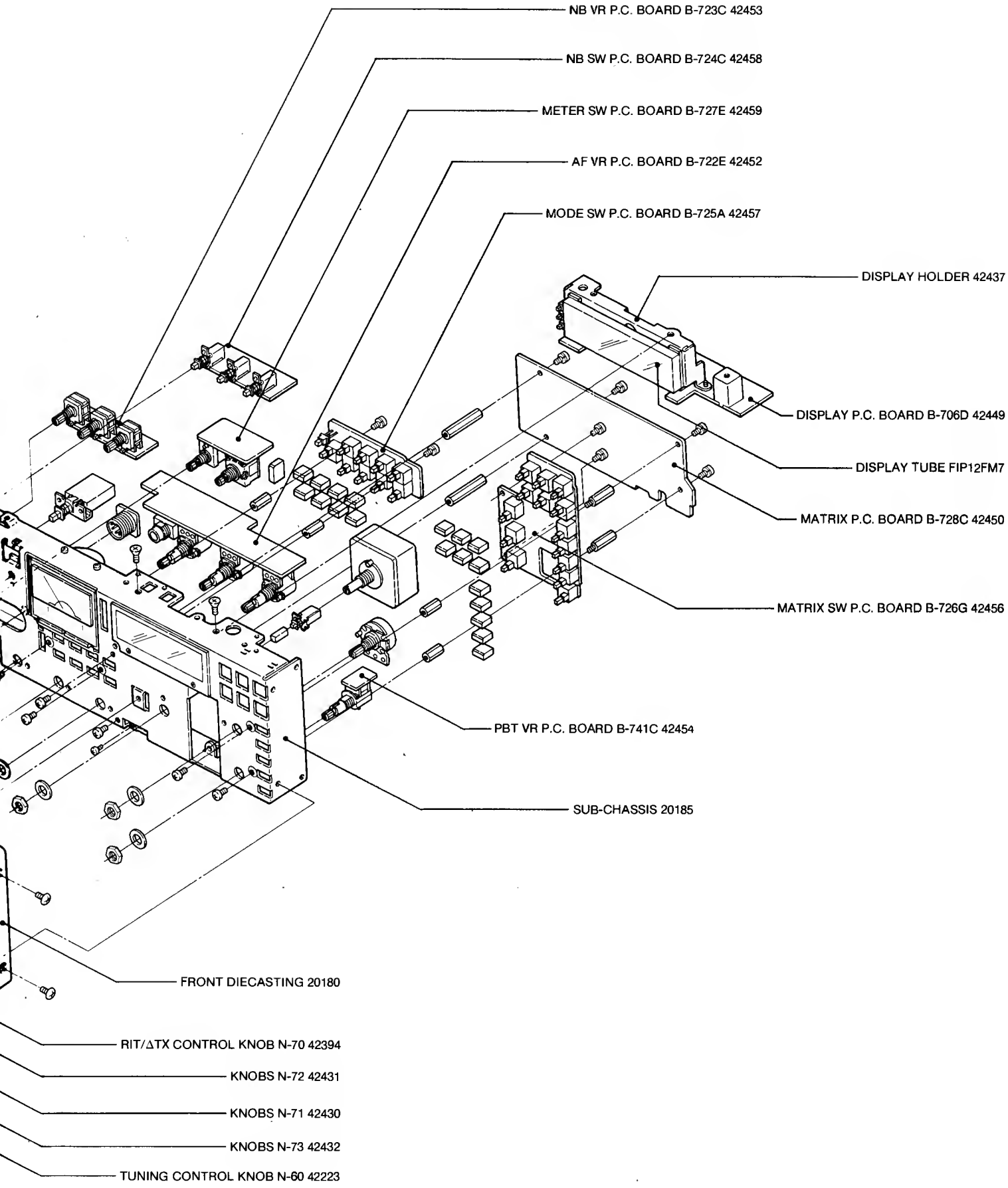
① Remove the TOP COVER (12 set screws).
② Remove the BOTTOM COVER (6 set screws).
③ Remove the rubber grip (a) from the TUNING CONTROL and unscrew (b).
④ Remove the FRONT PANEL control knobs by pulling them forward.
⑤ Remove the 4 frame-holding screws, and then remove the FRONT PANEL FRAME by pulling it forward.



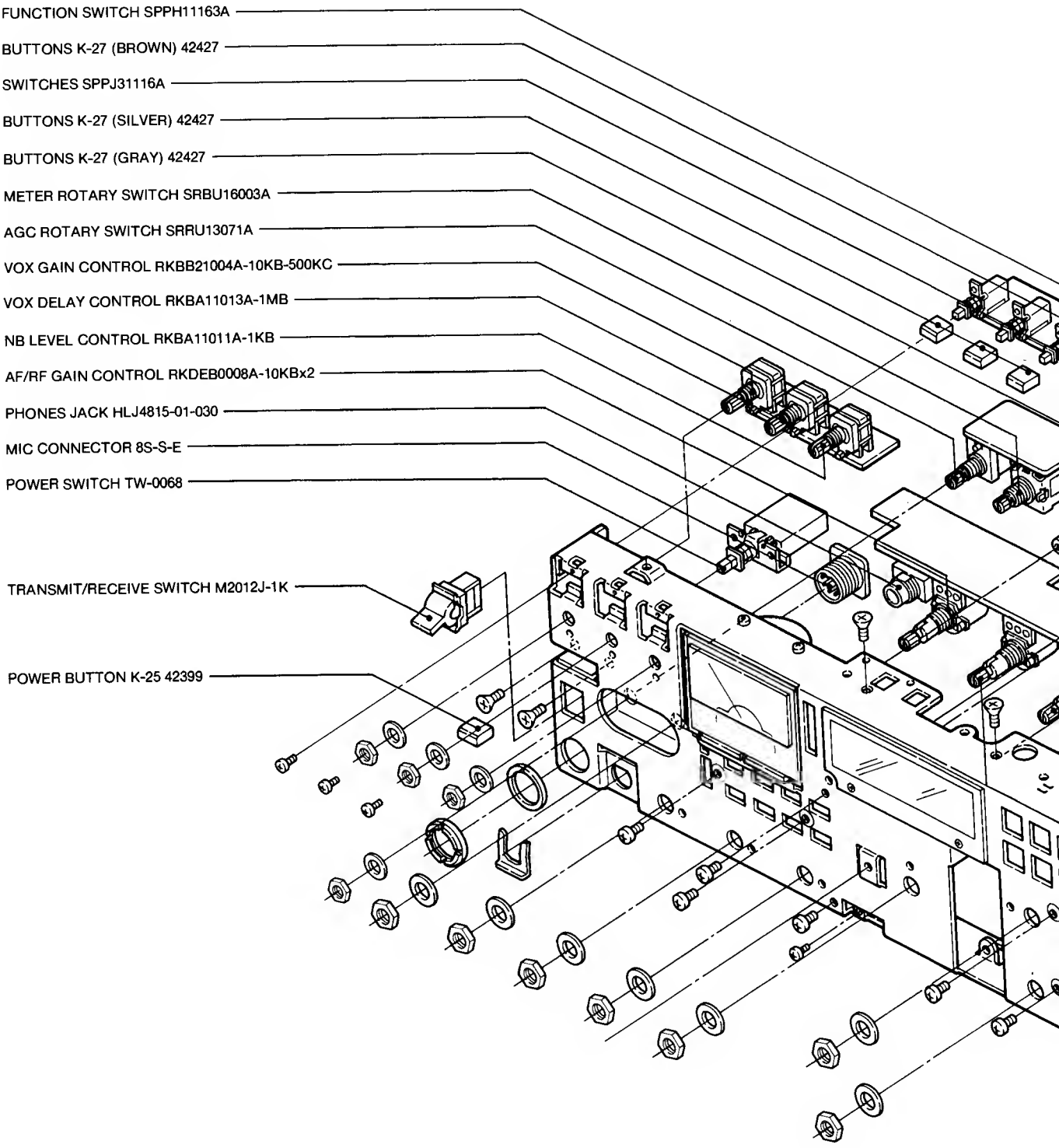

CHASSIS 10002
BOTTOM COVER
20184
2

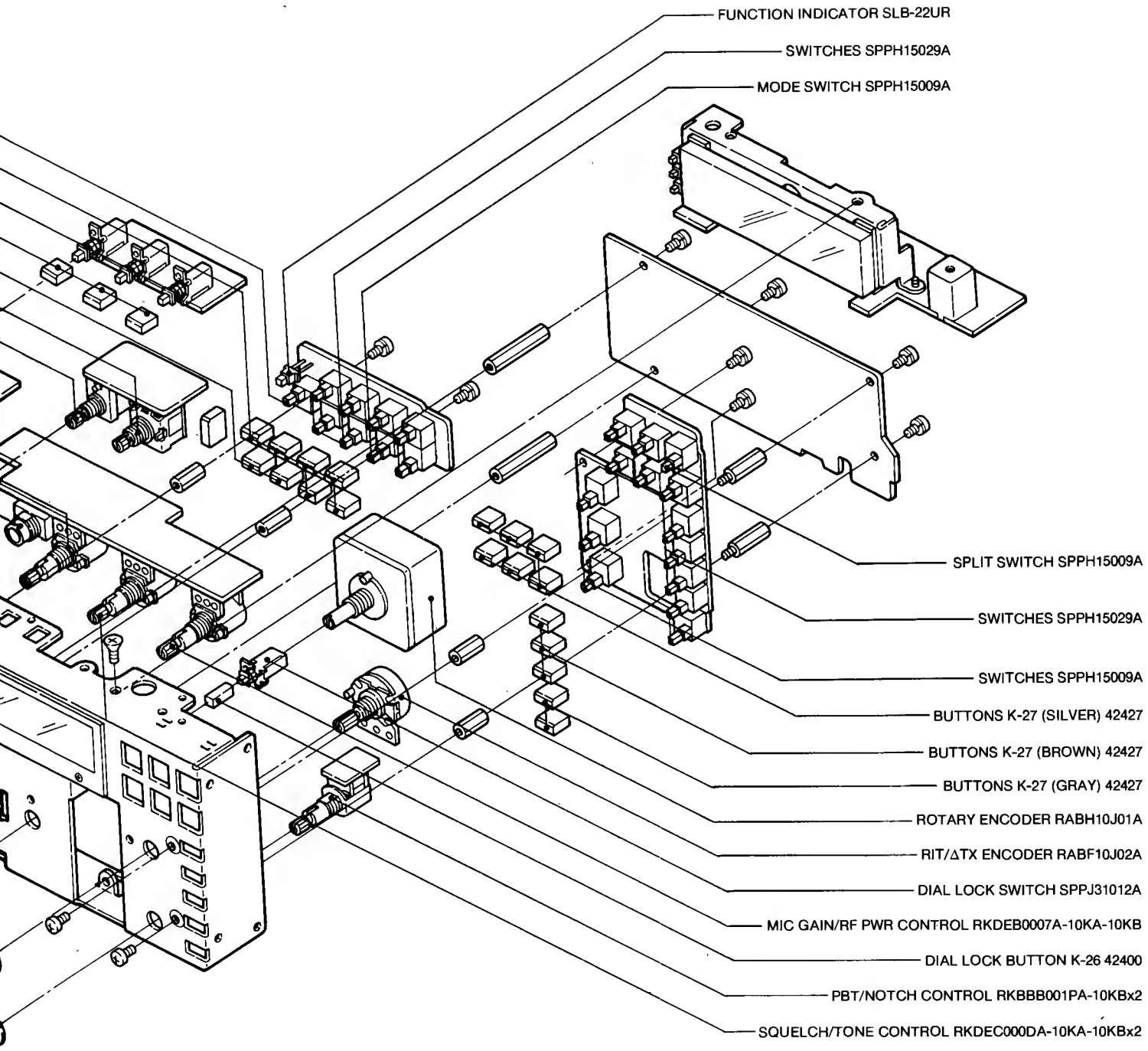
5 - 2 FRONT PANEL (1) DISASSEMBLY



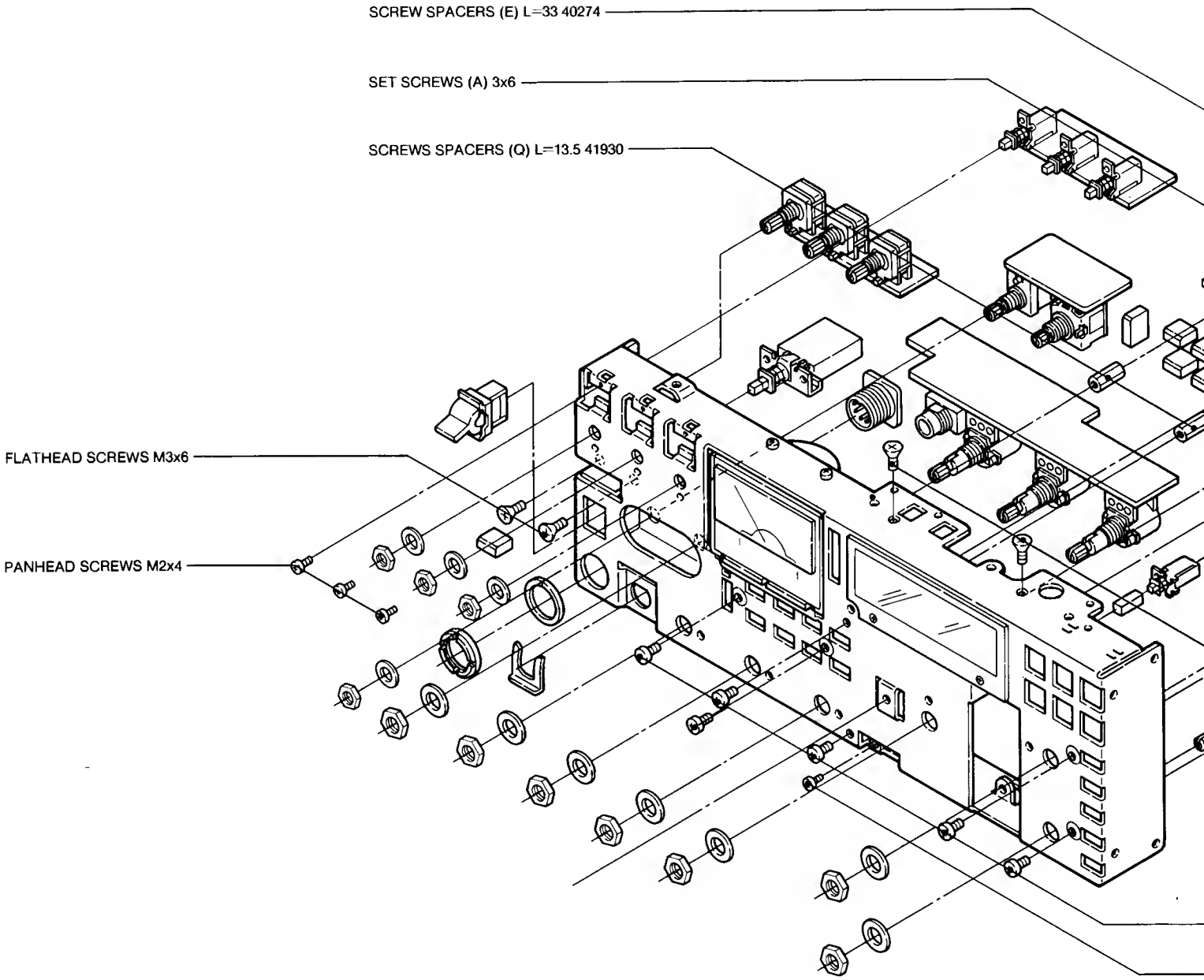

NB VR P.C. BOARD B-723C 42453
NB SW P.C. BOARD B-724C 42458
METER SW P.C. BOARD B-727E 42459
AF VR P.C. BOARD B-722E 42452
MODE SW P.C. BOARD B-725A 42457
DISPLAY HOLDER 42437
DISPLAY P.C. BOARD B-706D 42449
DISPLAY TUBE FIP12FM7
MATRIX P.C. BOARD B-728C 42450
MATRIX SW P.C. BOARD B-726G 42456
PBT VR P.C. BOARD B-741C 42454
SUB-CHASSIS 20185
FRONT DIECASTING 20180
RIT/ΔTX CONTROL KNOB N-70 42394
KNOBS N-72 42431
KNOBS N-71 42430
KNOBS N-73 42432
TUNING CONTROL KNOB N-60 42223

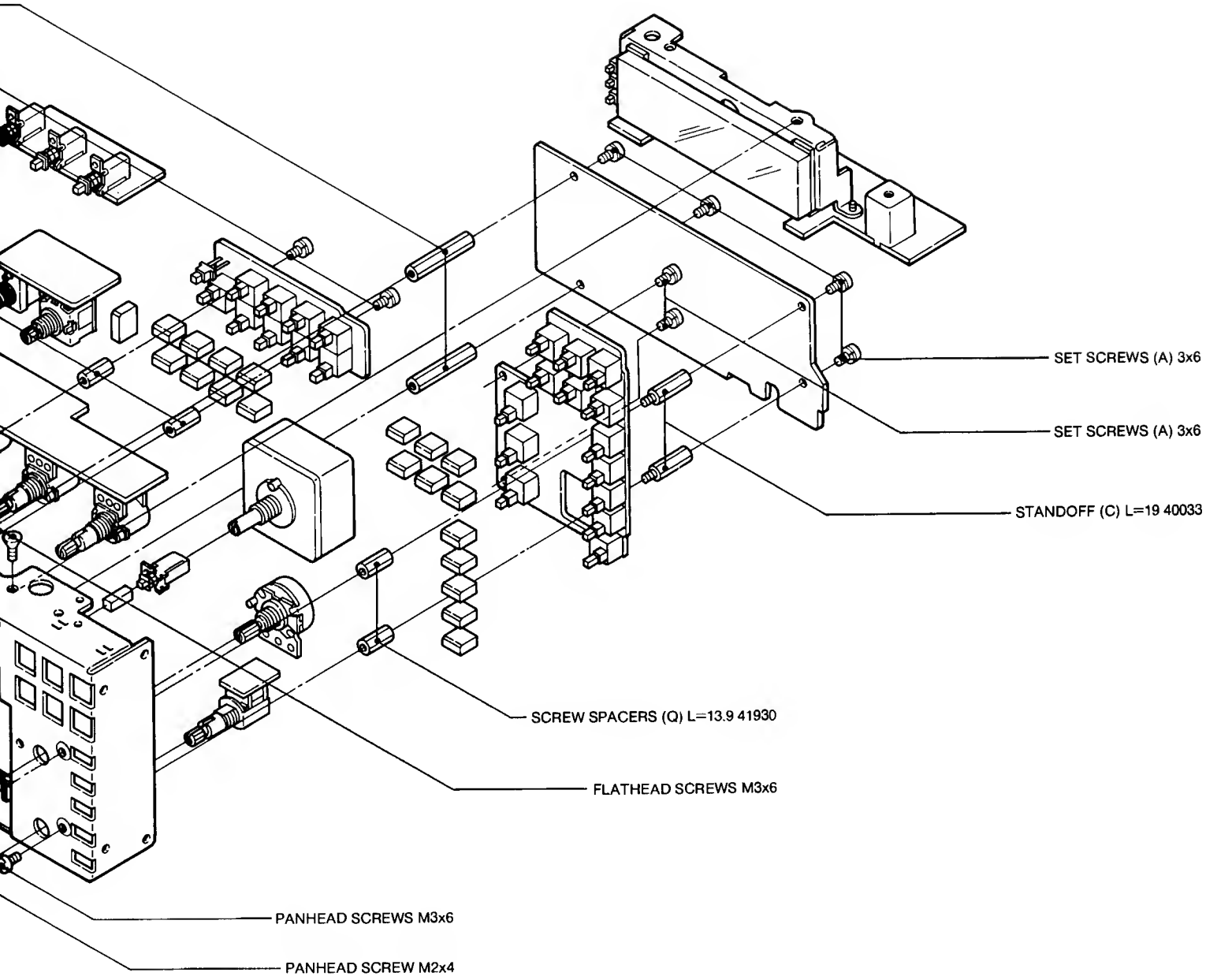
5 - 3 FRONT PANEL (2) DISASSEMBLY



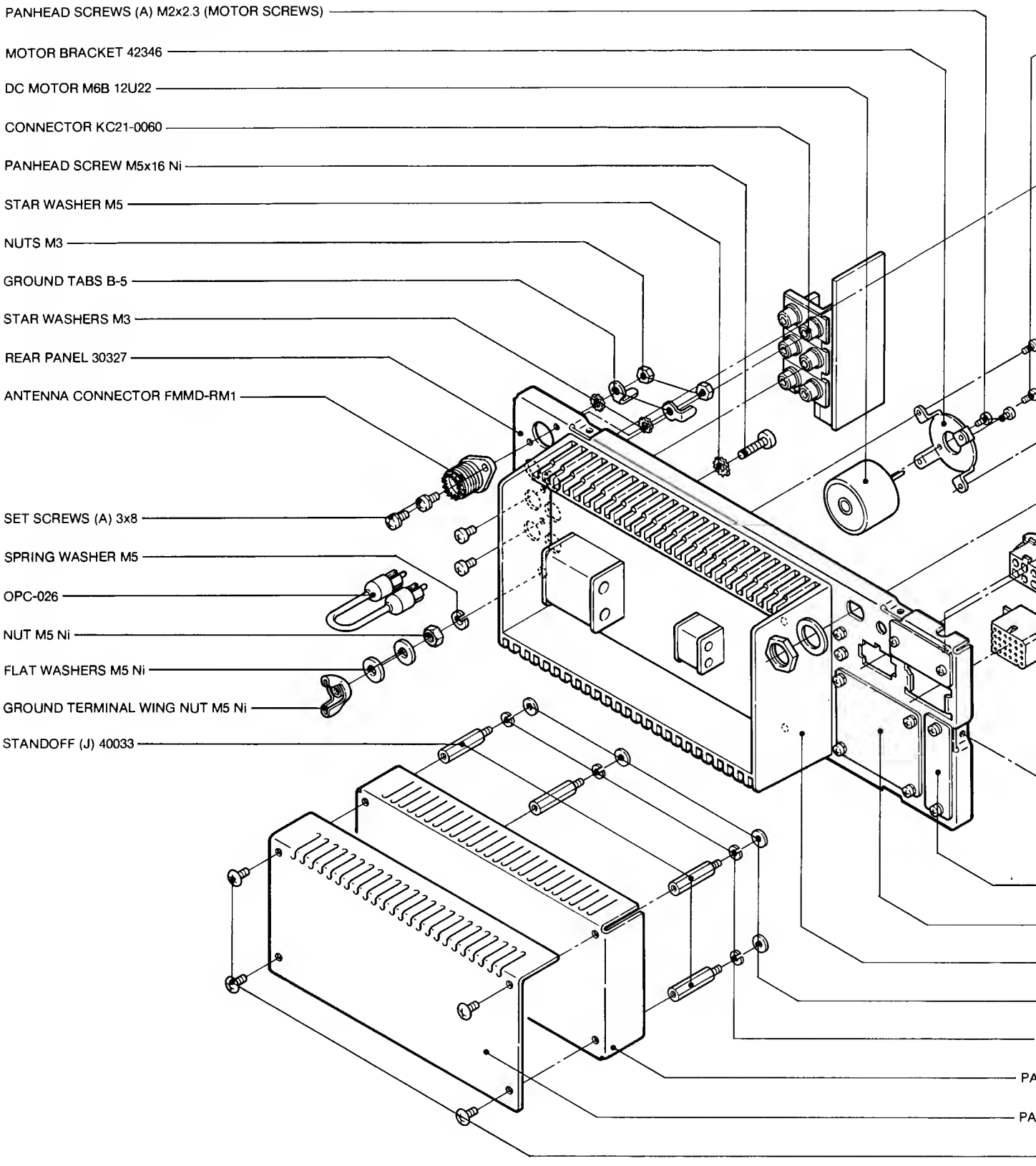

FUNCTION INDICATOR SLB-22UR
SWITCHES SPPH15029A
MODE SWITCH SPPH15009A
SPLIT SWITCH SPPH15009A
SWITCHES SPPH15029A
SWITCHES SPPH15009A
BUTTONS K-27 (SILVER) 42427
BUTTONS K-27 (BROWN) 42427
BUTTONS K-27 (GRAY) 42427
ROTARY ENCODER RABH10J01A
RIT/ΔTX ENCODER RABF10J02A
DIAL LOCK SWITCH SPPJ31012A
MIC GAIN/RF PWR CONTROL RKDEB0007A-10KA-10KB
DIAL LOCK BUTTON K-26 42400
PBT/NOTCH CONTROL RKBBB001PA-10KBx2
SQUELCH/TONE CONTROL RKDEC000DA-10KA-10KBx2

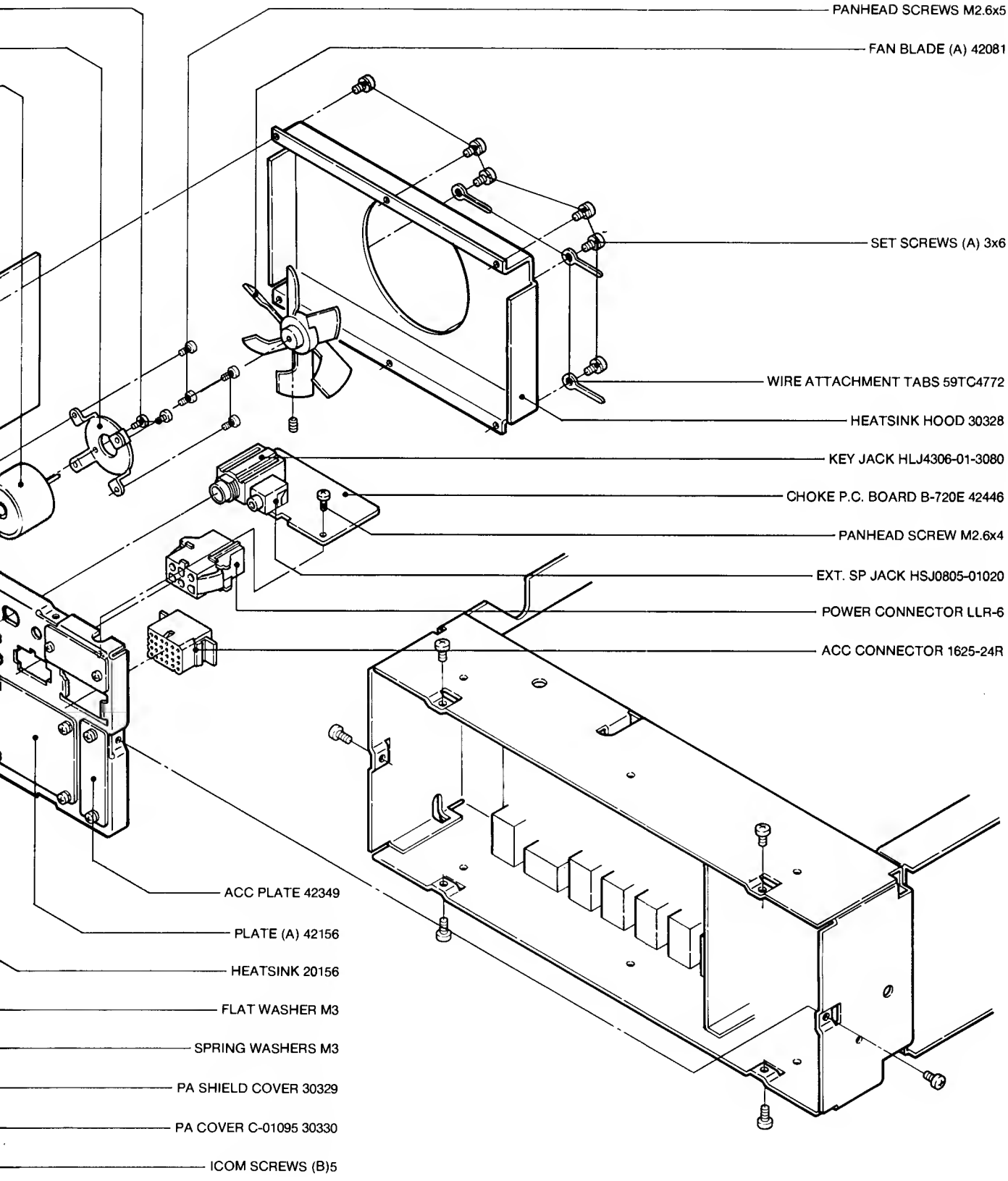
5 - 4 FRONT PANEL (3) DISASSEMBLY



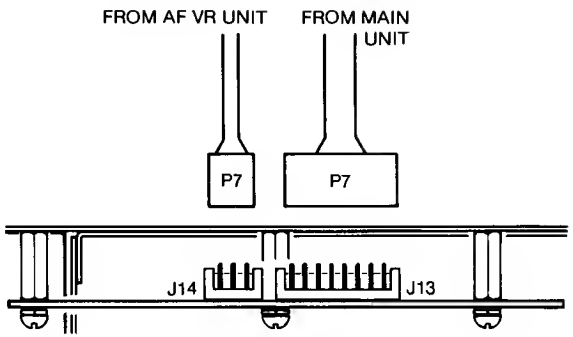

SET SCREWS (A) 3x6
SET SCREWS (A) 3x6
STANDOFF (C) L=19 40033
SCREW SPACERS (Q) L=13.9 41930
FLATHEAD SCREWS M3x6
PANHEAD SCREWS M3x6
PANHEAD SCREW M2x4

5 - 5 REAR PANEL DISASSEMBLY

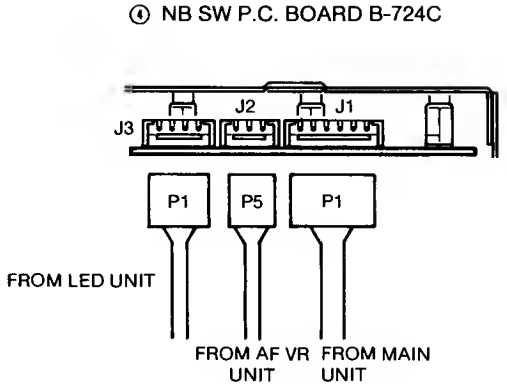


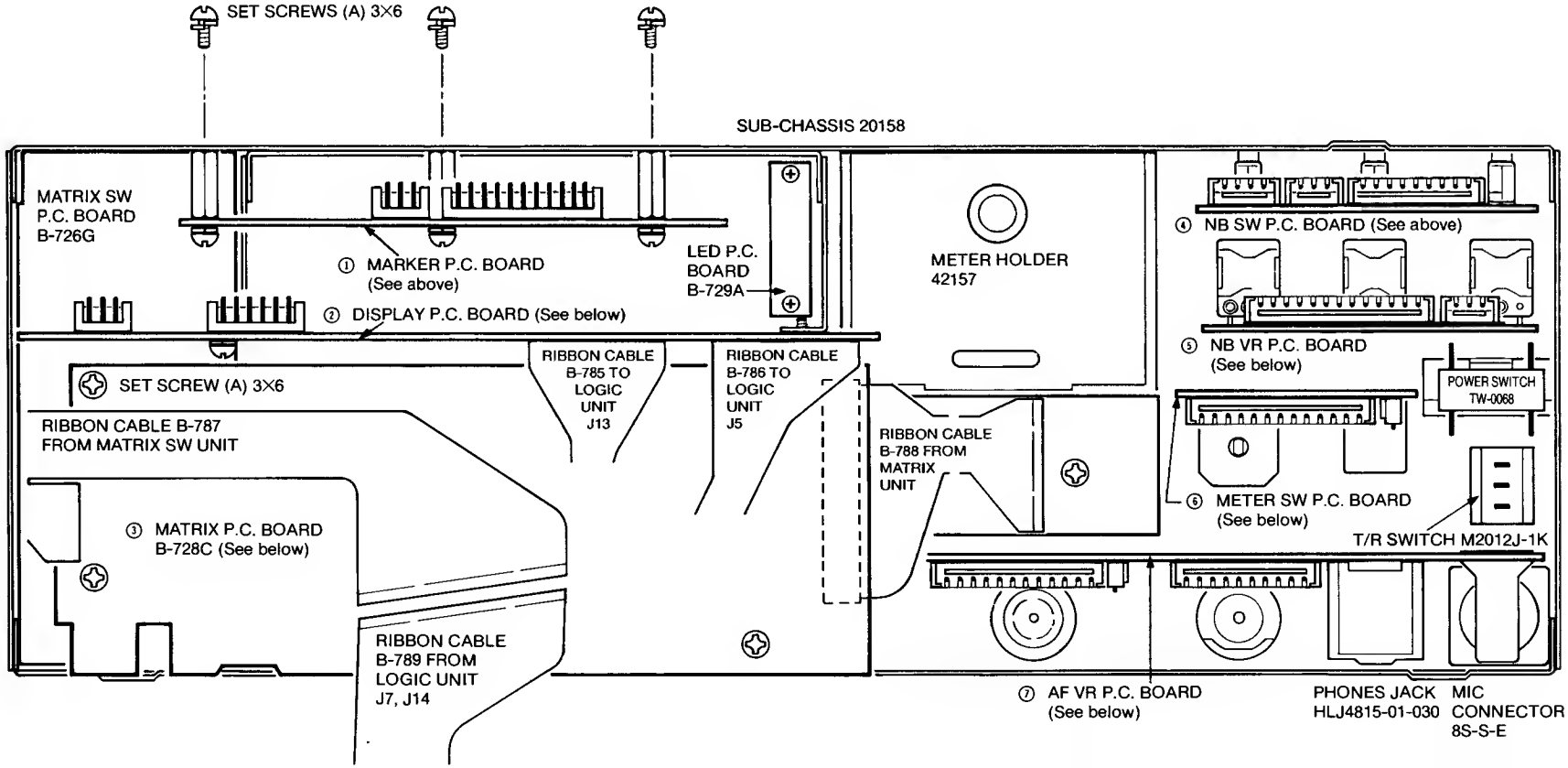

PANHEAD SCREWS M2.6x5
FAN BLADE (A) 42081
SET SCREWS (A) 3x6
WIRE ATTACHMENT TABS 59TC4772
HEATSINK HOOD 30328
KEY JACK HLJ4306-01-3080
CHOKE P.C. BOARD B-720E 42446
PANHEAD SCREW M2.6x4
EXT. SP JACK HSJ0805-01020
POWER CONNECTOR LLR-6
ACC CONNECTOR 1625-24R
ACC PLATE 42349
PLATE (A) 42156
HEATSINK 20156
FLAT WASHER M3
SPRING WASHERS M3
PA SHIELD COVER 30329
PA COVER C-01095 30330
ICOM SCREWS (B)5

① MARKER P.C. BOARD B-731E

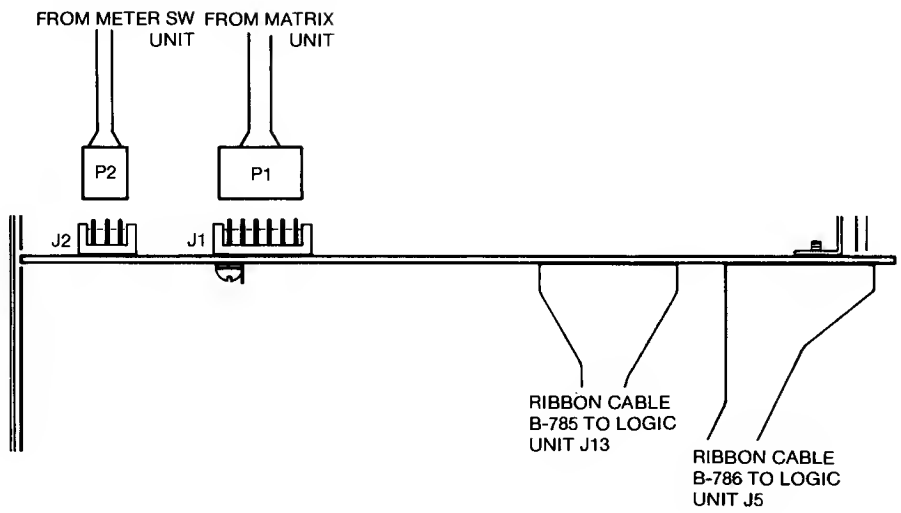


④ NB SW P.C. BOARD B-724C

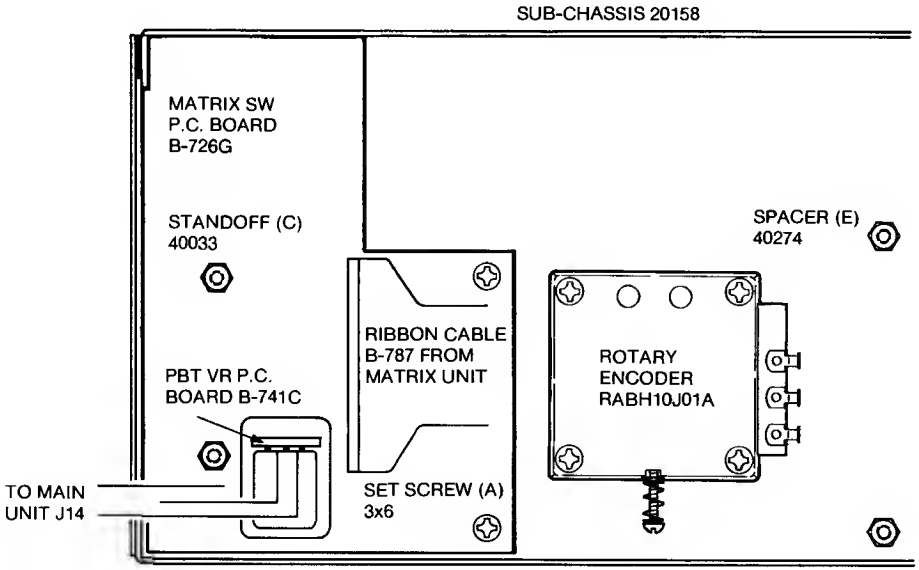




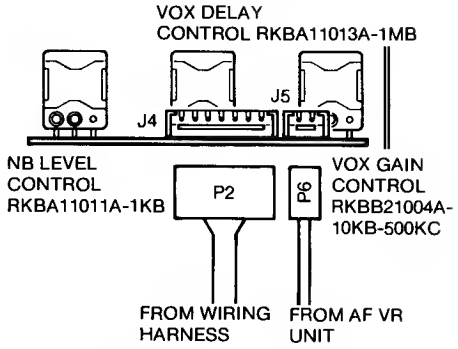
② DISPLAY P.C. BOARD B-706D



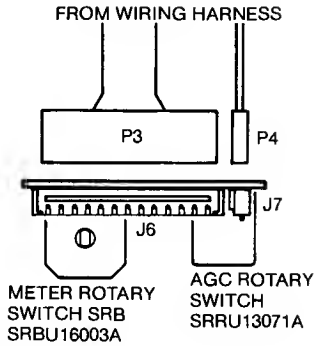
③ MATRIX P.C. BOARD B-728C



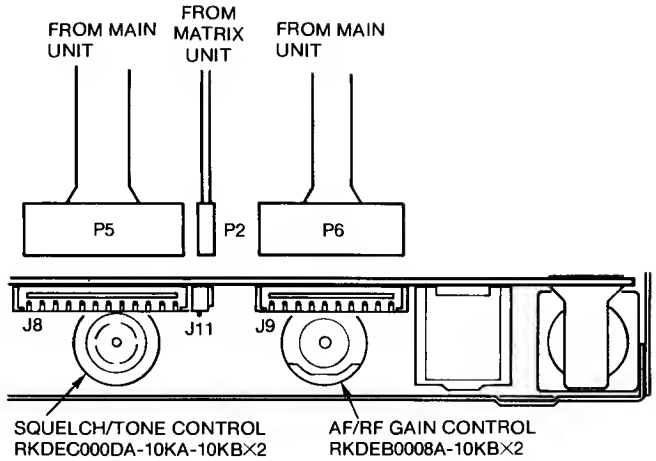
⑤ NB VR P.C. BOARD B-723C



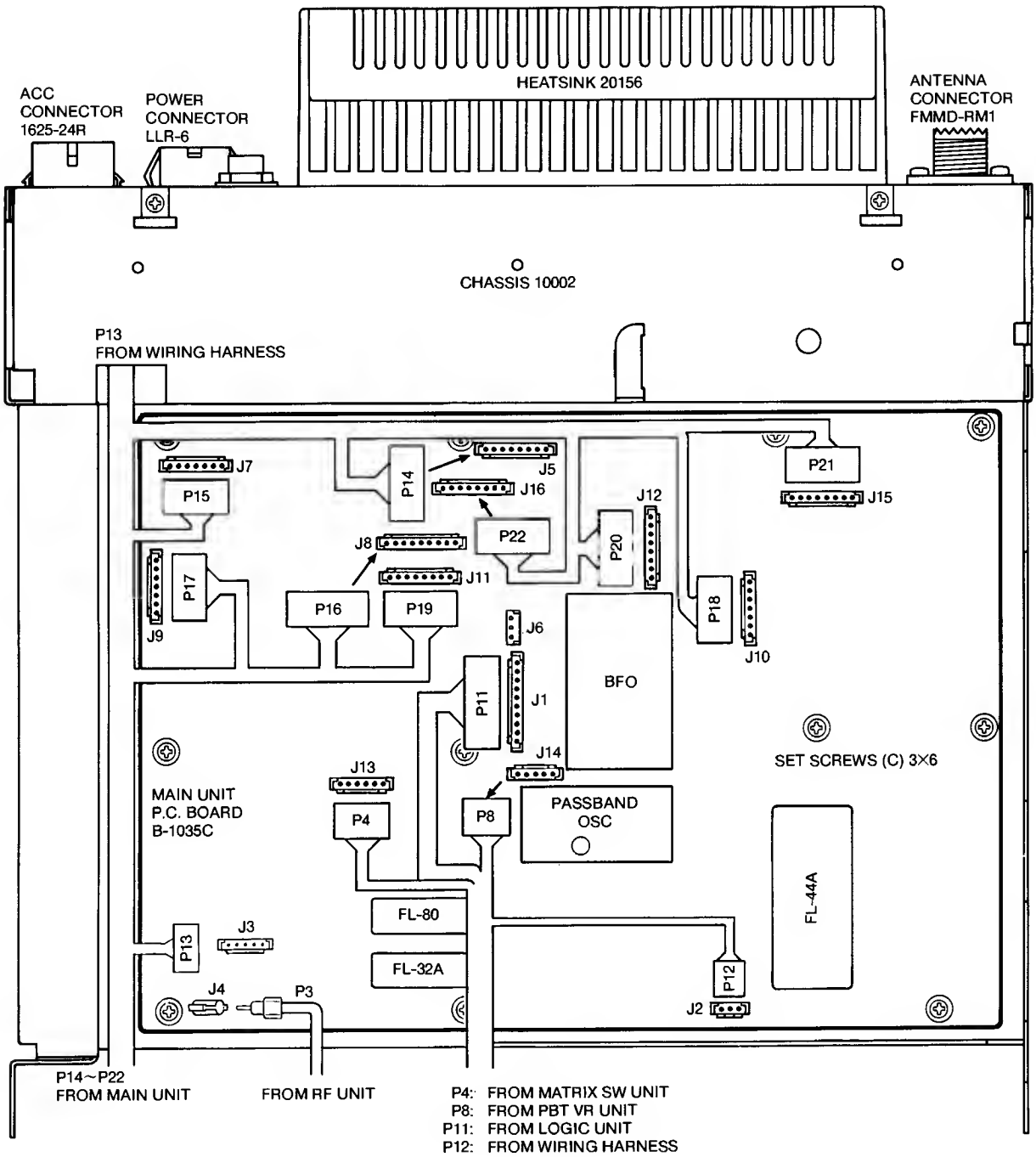
⑥ METER SW P.C. BOARD B-727E



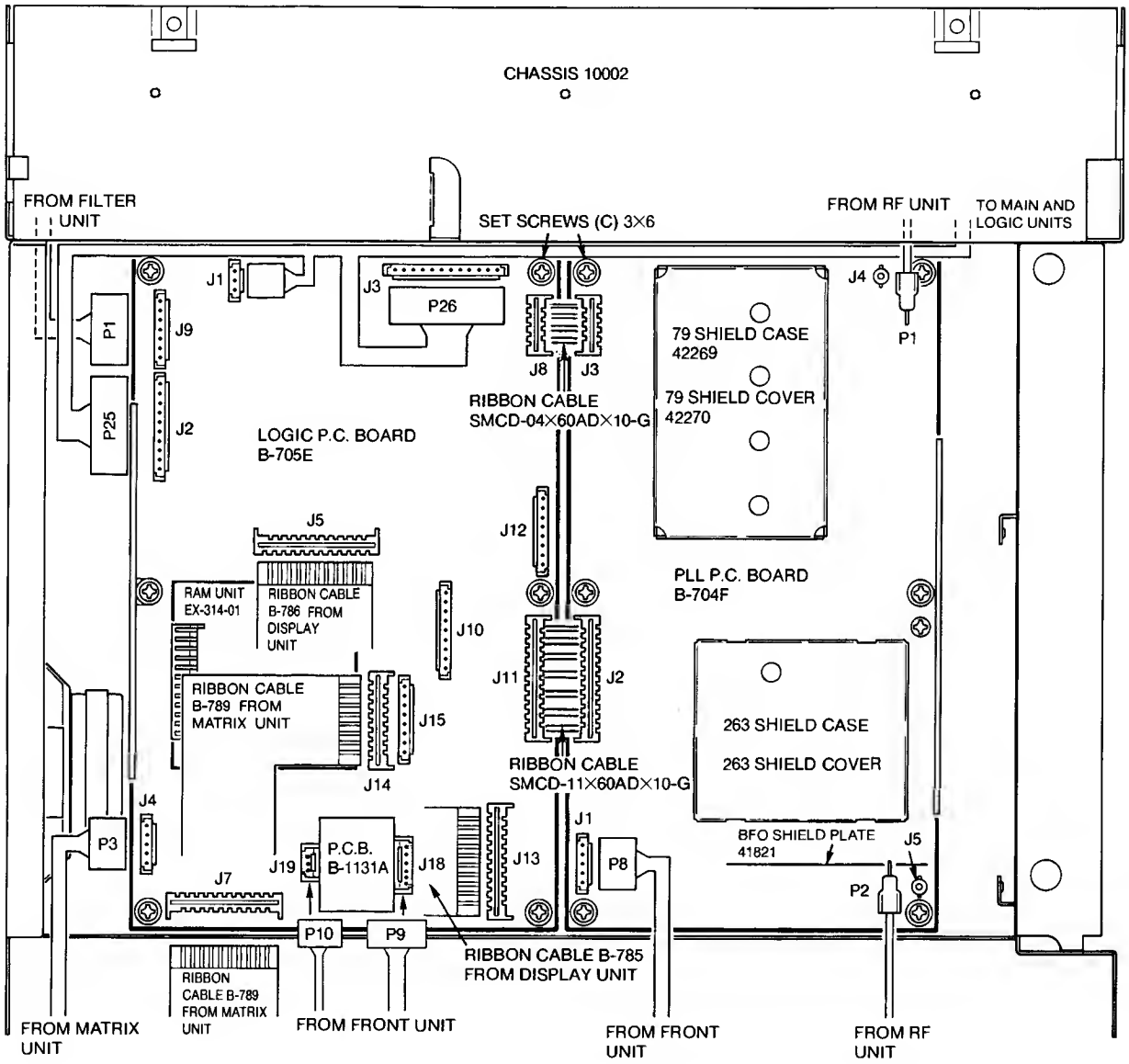
⑦ AF VR P.C. BOARD B-722E



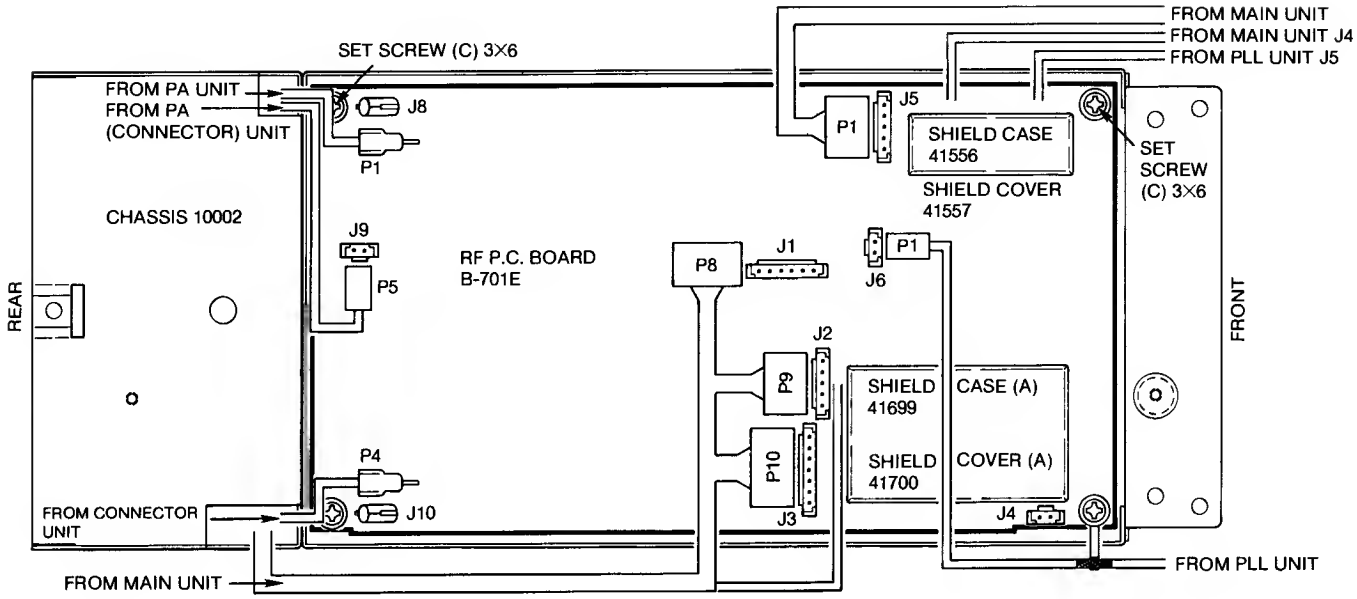
5 - 7 MAIN UNIT CONNECTOR ASSEMBLY



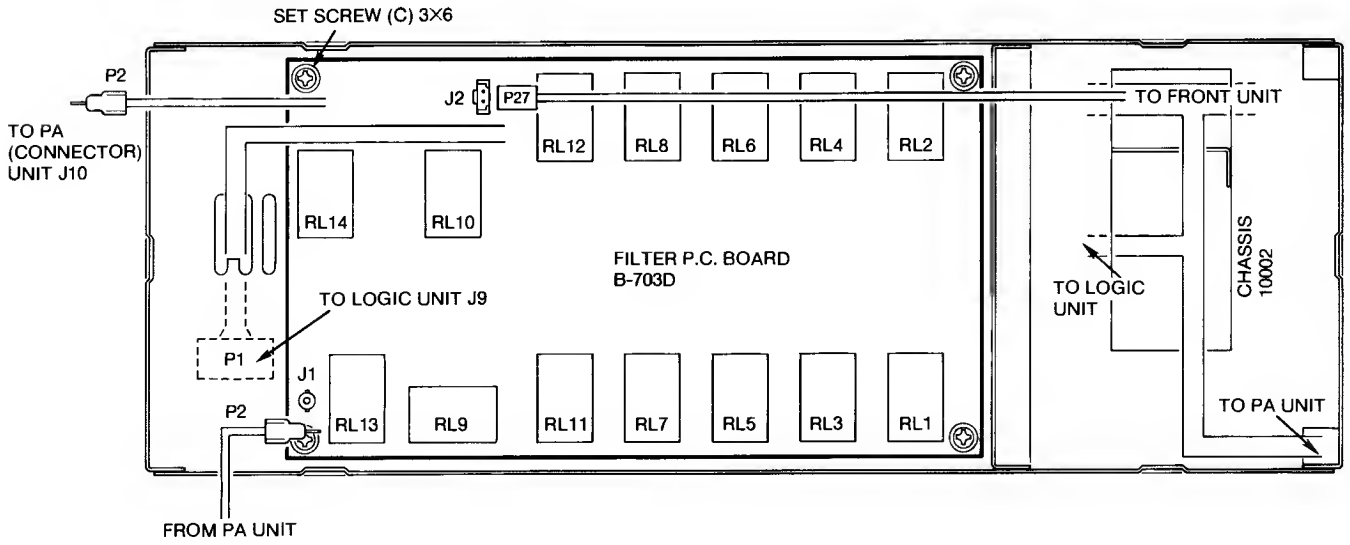
5 - 8 LOGIC AND PLL UNIT CONNECTOR ASSEMBLY



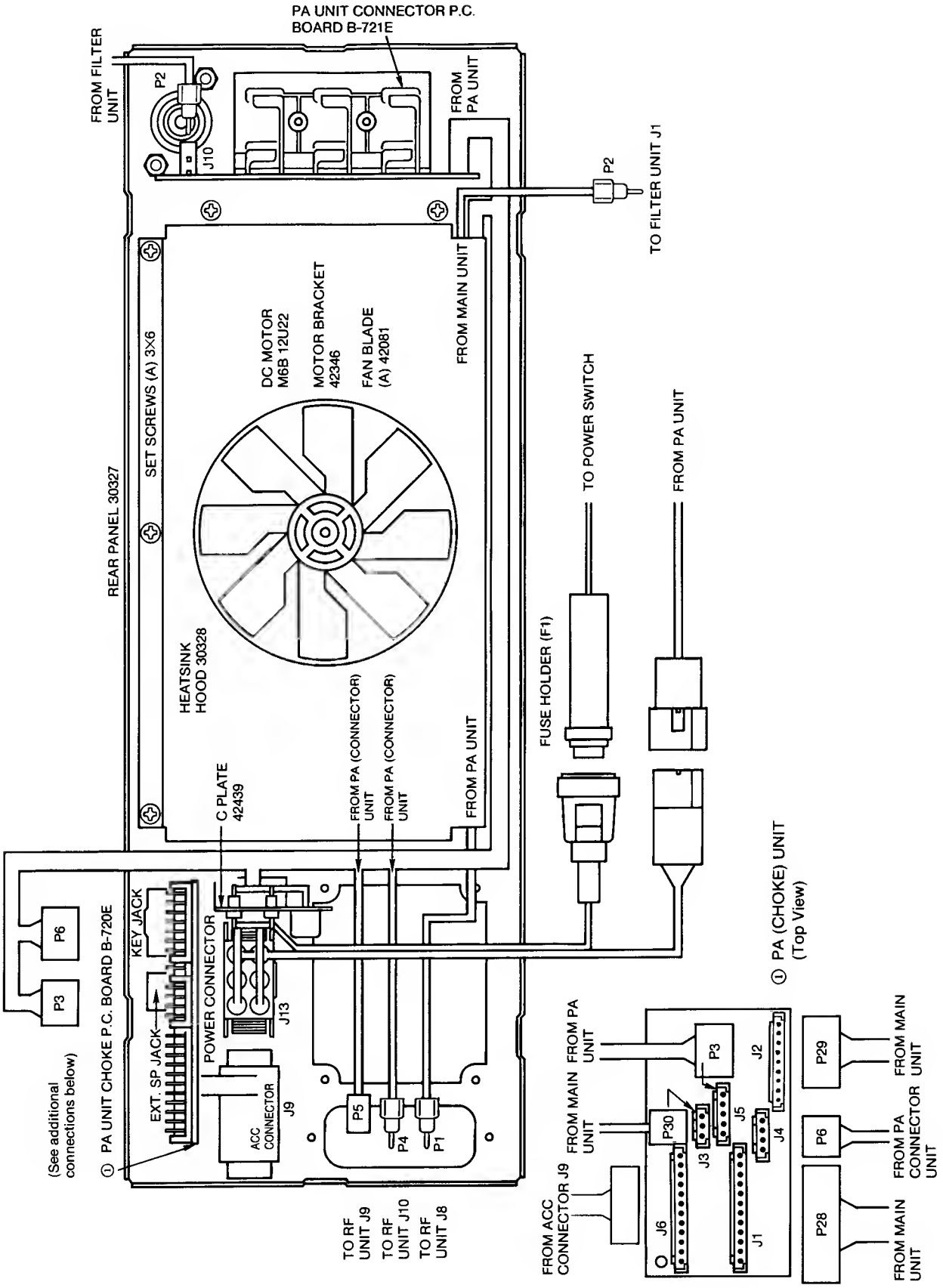
5 - 9 RF UNIT CONNECTOR ASSEMBLY



5 - 10 FILTER UNIT CONNECTOR ASSEMBLY



5 - 11 REAR PANEL CONNECTOR ASSEMBLY

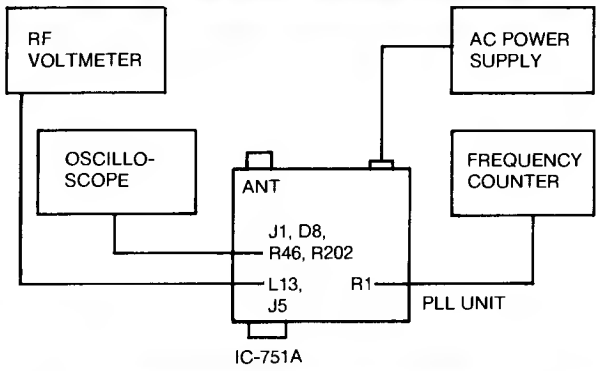


SECTION 6 MAINTENANCE AND ADJUSTMENT

6 - 1 PREPARATION BEFORE SERVICING

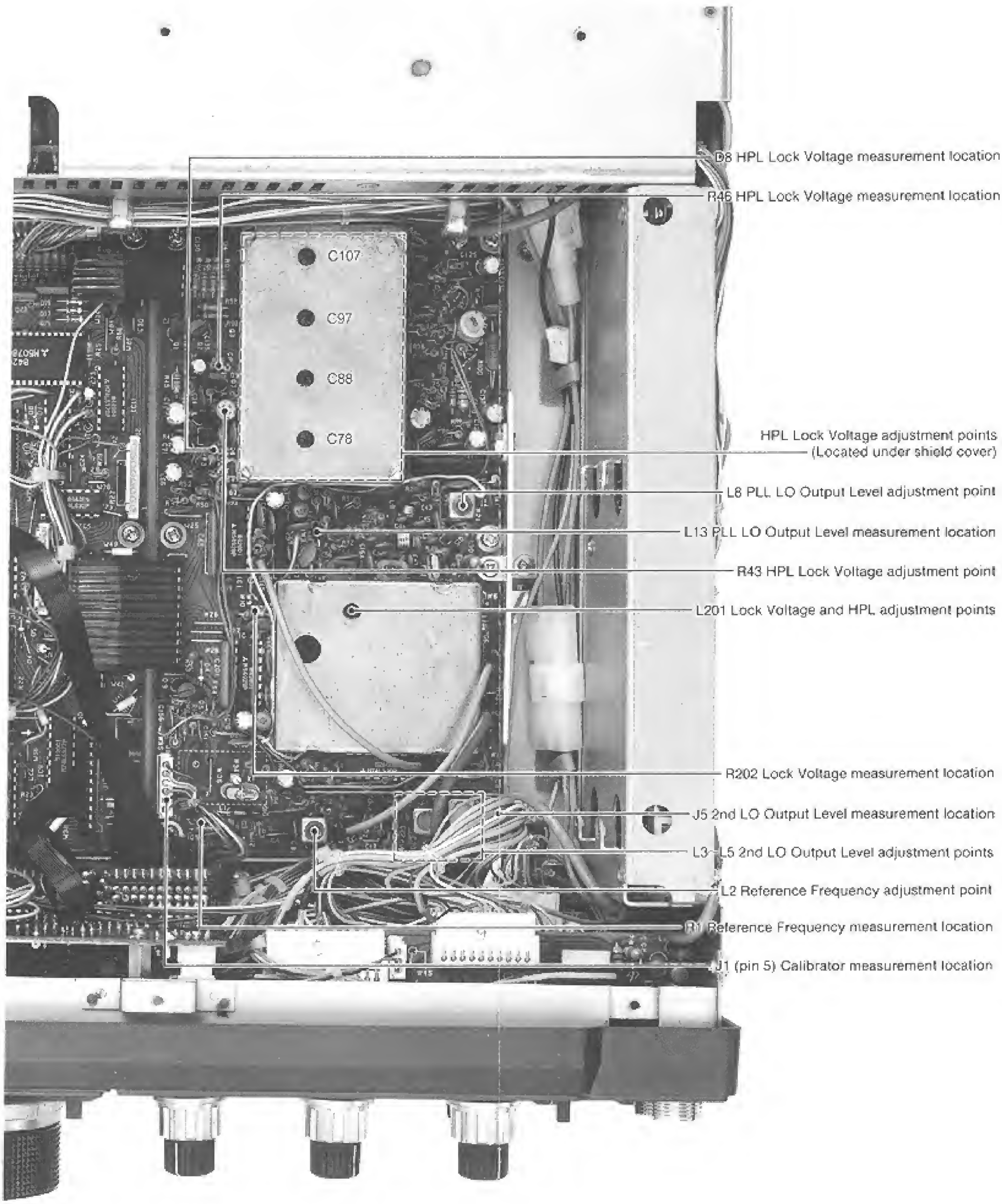
1. Detach the power cord and turn **OFF** the VOLUME/POWER CONTROL before performing any work on the transceiver.
2. Do not short circuit components while making adjustments.
3. Use an insulated tuning tool for all adjustments.
4. Do not force any of the variable components. Turn them slowly and smoothly.
5. Follow the instructions exactly. If an indicated result is not obtained, repeat the instruction until the correct result is obtained.
6. Check the condition of connectors, solder joints and screws when adjustments are complete. Confirm that components do not touch each other.
7. Confirm defective operation of the transceiver first when checking an out-of-service unit. Verify that external sources do not cause the problem.
8. Use the correct tools and test equipment.
9. Remove the transceiver case as shown in SECTION 5-1.
10. Attach a 13.8V DC external power source to the power supply connector. Be sure to check the polarity.
11. For transmission problems, attach a dummy load to the antenna connector. For reception problems, attach an antenna or signal generator to the antenna connector. **DO NOT transmit** into the signal generator.
12. Recheck for the suspected malfunction with the VOLUME/POWER CONTROL **ON**.
13. Check the defective circuit. Measure the DC voltages of the collector, base and emitter of each transistor.

6 - 2 PLL ADJUSTMENT

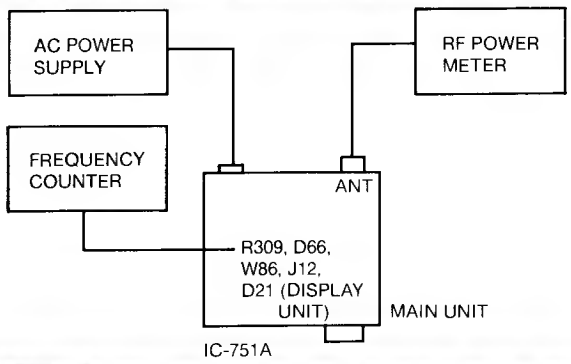
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.8V DC • Current capacity : 20A or more (2) OSCILLOSCOPE • Frequency range : DC ~ 20MHz • Measuring range : 0.01 ~ 10V (3) FREQUENCY COUNTER • Frequency range : 0.1 ~ 90MHz • Frequency accuracy : ±1ppm or better • Sensitivity : 100mV or better (4) RF VOLTMETER • Frequency range : 0.1 ~ 80MHz • Measuring range : 0.01 ~ 10V	

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT UNIT	MEASUREMENT LOCATION	VALUE	ADJUSTMENT POINT UNIT	ADJUSTMENT POINT ADJUST
CALIBRATOR	1	• Frequency display: 8.0000MHz • LSB General mode	PLL	Connect an oscilloscope to J1 pin 5.	3V	TOP PANEL	CALIBRATOR CONTROL
REFERENCE FREQUENCY	1	• Frequency display: 8.0000MHz • LSB General mode	PLL	Connect a frequency counter to R1 (R2 side).	30.7200MHz	PLL	L2
PLL LO OUTPUT LEVEL	1	• Frequency display: 8.0000MHz • LSB General mode	PLL	Connect an RF Voltmeter to L13.	Adjust to maximum output: 400mV~ 1Vp-p	PLL	L8
LOCK VOLTAGE	1	• Frequency display: 8.0000MHz • LSB General mode	PLL	Connect an oscilloscope to R202.	3V	PLL	L201
	2	• Frequency display: 7.9999MHz			1.5~2V		Verify
HPL LOCK VOLTAGE	1	• Frequency display: 7.9999MHz • LSB General mode	PLL	Connect an oscilloscope to R46.	6.5V	PLL	C78
	2	• Frequency display: 14.9999MHz • LSB General mode					C88
	3	• Frequency display: 21.9999MHz					C97
	4	• Frequency display: 29.9999MHz					C107
	5	• Frequency display: 8.0000MHz			3V		L201
	6	• Frequency display: 15.0000MHz					
	7	• Frequency display: 22.0000MHz					
	8	• Frequency display: 7.9999MHz • LSB General mode		Connect an oscilloscope to the cathode of D8.	2.5V		R43
2nd LO OUTPUT LEVEL	1	• Frequency display: 8.0000MHz • LSB General mode	PLL	Terminate J5 to ground with a 50Ω resistor. Connect an RF Voltmeter to J5.	Adjust to maximum output: 250~400mV rms	PLL	L3~L5
		NOTE: After completing the adjustment, return J5 to its original condition.					

PLL UNIT

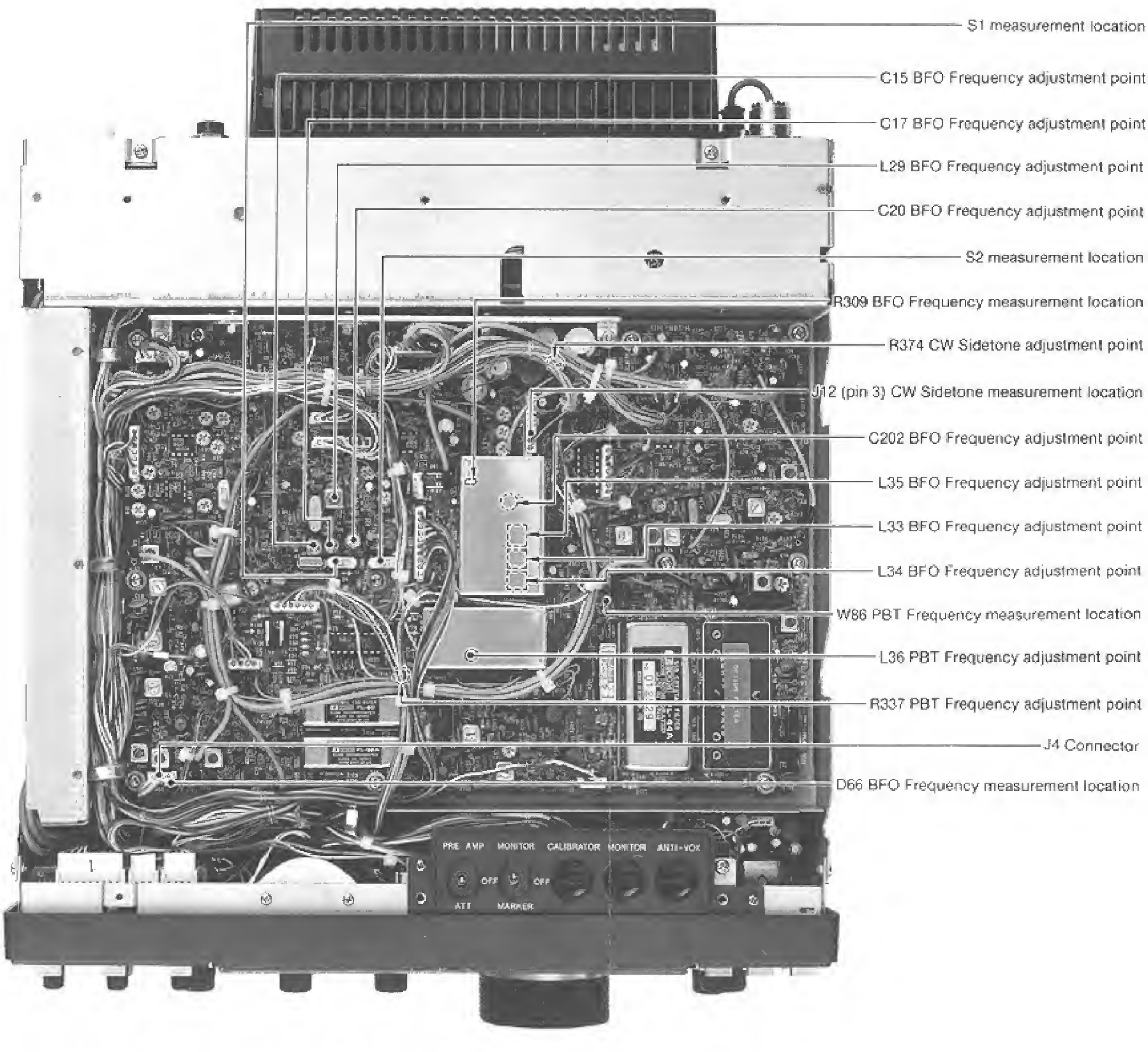

D8 HPL Lock Voltage measurement location
R46 HPL Lock Voltage measurement location
C107
C97
C88
C78
HPL Lock Voltage adjustment points
(Located under shield cover)
L8 PLL LO Output Level adjustment point
L13 PLL LO Output Level measurement location
R43 HPL Lock Voltage adjustment point
L201 Lock Voltage and HPL adjustment points
R202 Lock Voltage measurement location
J5 2nd LO Output Level measurement location
L3 L5 2nd LO Output Level adjustment points
L2 Reference Frequency adjustment point
R1 Reference Frequency measurement location
J1 (pin 5) Calibrator measurement location

6 - 3 FREQUENCY ADJUSTMENT

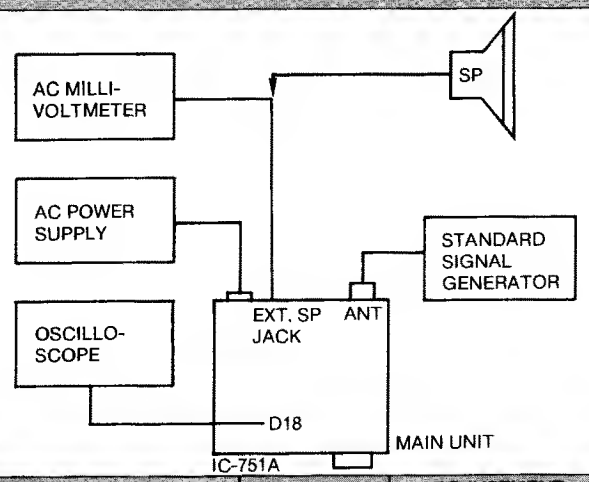
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.8V DC • Current capacity : 20A or more (2) FREQUENCY COUNTER • Frequency range : 0.1 ~ 90MHz • Frequency accuracy : ±1ppm or better • Sensitivity : 100mV or better (3) RF POWER METER (TERMINATED TYPE) • Measuring range : 20 ~ 200W • Frequency range : 1.8 ~ 30MHz • Impedance : 50Ω • SWR : 1.1 or less	

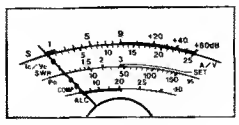
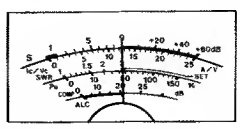
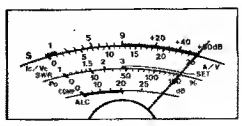
ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT UNIT	MEASUREMENT LOCATION	VALUE	ADJUSTMENT POINT UNIT	ADJUSTMENT POINT ADJUST
BFO FREQUENCY	1	• Frequency display: 14MHz • USB mode • Set transceiver in receive mode.	MAIN	Connect a frequency counter to R309 (X6 side).	9.01300MHz	MAIN	C202
	2	• LSB mode			9.01000MHz		L34
	3	• CW mode			9.00990MHz		L33
	4	• RTTY mode			9.008475MHz		L35
	5	• AM mode			No output		Verify
	6	• Confirm the RF power meter is connected to the ANTENNA CONNECTOR then set transceiver in transmit mode.			9.01000MHz		Verify
	7	• FM mode • Set transceiver in transmit mode.			9.01000MHz		L29
	8	• CW mode • Unplug the connector inserted at J4 then press the key on the CW keyer.		Connect a frequency counter to D66.	9.01060MHz		C20
	9	• RTTY mode • S1: Right (Reverse side) • S2: Left (170Hz side)			9.01077MHz		C17
	10	• S2: Right (850Hz side)			9.01145MHz		C15
		NOTE: Repeat adjustments 6 through 10 several times.					
	11	• S1: Left (Normal side) • S2: Left/Right	MAIN	Connect a frequency counter to D66.	Switch S2 alternately between the right and left sides, confirming that the frequency is 9.01060MHz		Verify
		NOTE: Return J4 to its original condition after completing Adjustment 8.					
PBT FREQUENCY	1	• Frequency display: 14MHz • USB mode • FILTER: ON • PBT CONTROL: Set in center position • Turn R196 fully CW and set the transceiver in receive mode.	MAIN	Connect a frequency counter to W86.	9.46650MHz	MAIN	L36
	2	• PBT CONTROL: turn fully CW			9.46800MHz or higher		Verify
	3	• PBT CONTROL: turn fully CCW			9.46500MHz or lower		
	4	• PBT CONTROL: Set in center position. Set transceiver in transmit mode.			9.46650MHz		R337
CW SIDETONE	1	• CW mode • Set the transceiver in transmit mode.	MAIN	Connect a frequency counter to pin 3 on J12.	700Hz	MAIN	R374
DC-DC CONVERTER FREQUENCY	1	• Receive mode	DISPLAY	Connect a frequency counter to the cathode of D21. (Location on p.7-3)	approx. 20kHz		Verify

MAIN UNIT

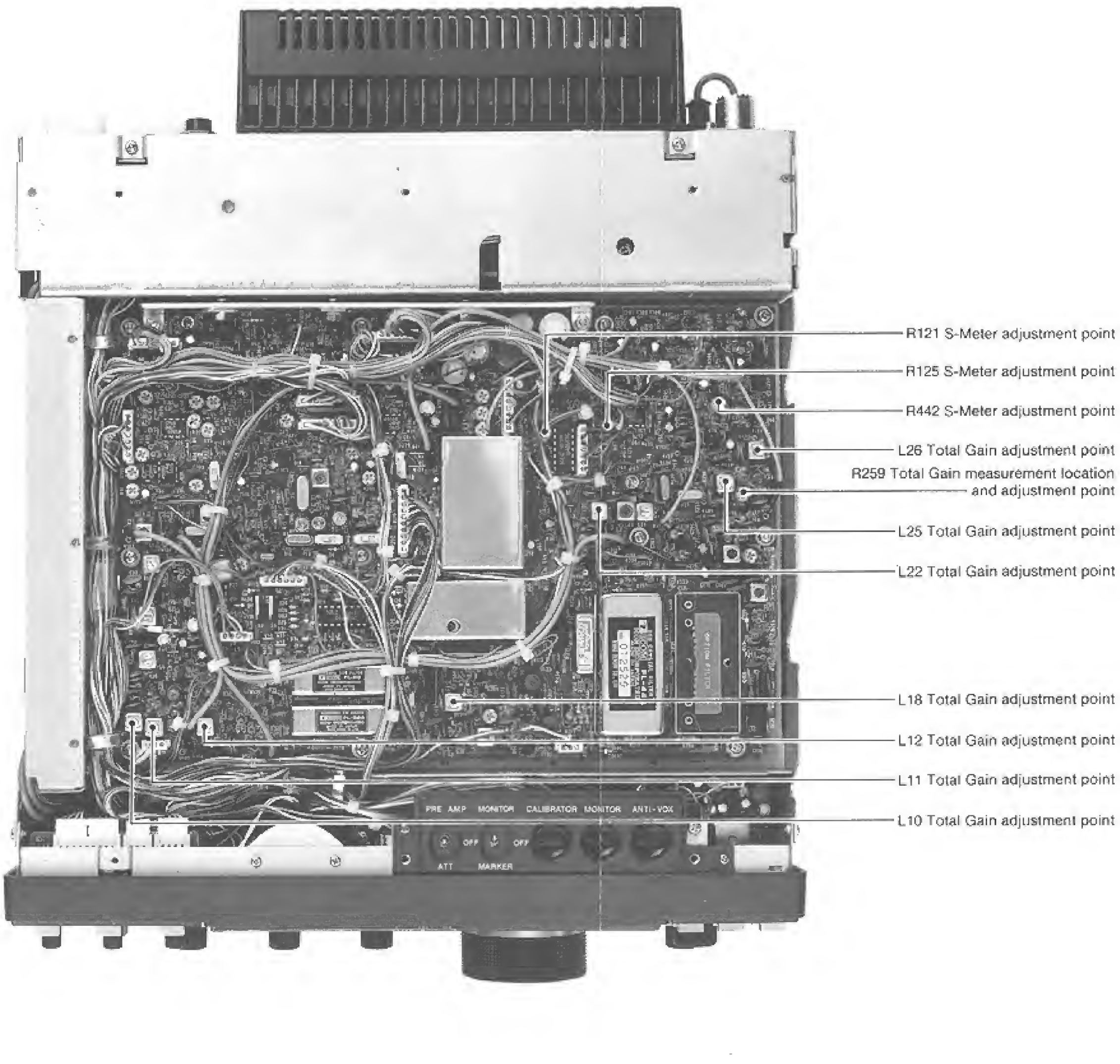

S1 measurement location
C15 BFO Frequency adjustment point
C17 BFO Frequency adjustment point
L29 BFO Frequency adjustment point
C20 BFO Frequency adjustment point
S2 measurement location
R309 BFO Frequency measurement location
R374 CW Sidetone adjustment point
J12 (pin 3) CW Sidetone measurement location
C202 BFO Frequency adjustment point
L35 BFO Frequency adjustment point
L33 BFO Frequency adjustment point
L34 BFO Frequency adjustment point
W86 PBT Frequency measurement location
L36 PBT Frequency adjustment point
R337 PBT Frequency adjustment point
J4 Connector
D66 BFO Frequency measurement location
PRE AMP
MONITOR
CALIBRATOR
MONITOR
ANTI-VOX
OFF
OFF
ATT
MARKER

6 - 4 RECEIVER ADJUSTMENT

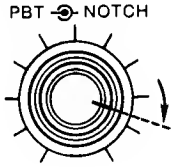
TEST INSTRUMENTS REQUIRED	MEASUREMENT CONNECTION LOCATION
(1) AC POWER SUPPLY • Output voltage : 13.8V DC • Current capacity : 20A or more (2) STANDARD SIGNAL GENERATOR (SSG) • Frequency range : 0.1 ~ 40MHz • Output level : −127 ~ −17dBm (0.1μV~32mV) (3) AC MILLI-VOLTMETER • Measuring range : 10mV ~ 3V (4) EXTERNAL SPEAKER • Impedance : 8Ω (5) OSCILLOSCOPE • Frequency range : DC ~ 20MHz • Measuring range : 0.01 ~ 10V	

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
TOTAL GAIN	1	• Frequency display: 14MHz • USB mode • RF GAIN CONTROL: Turn fully CW • RF AMP: OFF • FILTER SWITCH: OFF • NOTCH SWITCH: OFF • PBT CONTROL: Set in center position. • TONE CONTROL: Set in center position. • SQUELCH CONTROL: Turn fully CCW. • AGC SWITCH: Set in FAST position. • RIT SWITCH: OFF • NB WIDE SWITCH: OFF • Set the output level of the SSG at −117dBm (0.32μV).	REAR PANEL	Connect an AC milli-voltmeter to the EXT. SP JACK.	Adjust to MAX. AF output.	MAIN	L10, L11, L12, L18, L22, L25, L26
	2	• Set the output level of the SSG to −73dBm (50μV).			Adjust the AF GAIN CONTROL until 2.5V is output.	FRONT PANEL	AF GAIN CONTROL
	3	• Turn OFF the output of the SSG.			Adjust R259 to a point where the noise level is 30dB (about 80mV) from 2.5V.	MAIN	R259
S-METER	1	• Frequency display: 14MHz Apply no signal to the ANTENNA CONNECTOR.	FRONT PANEL	 Multifunction meter (S scale)	S0 (S scale)	MAIN	R125
	2	• Apply a −73dBm (50μV) RF signal to the ANTENNA CONNECTOR.		 Multifunction meter (S scale)	S9 (S scale)		R442
	3	• Apply a −13dBm (50mV) RF signal to the ANTENNA CONNECTOR.		 Multifunction meter (S scale)	S9 +60dB (S scale)		R121

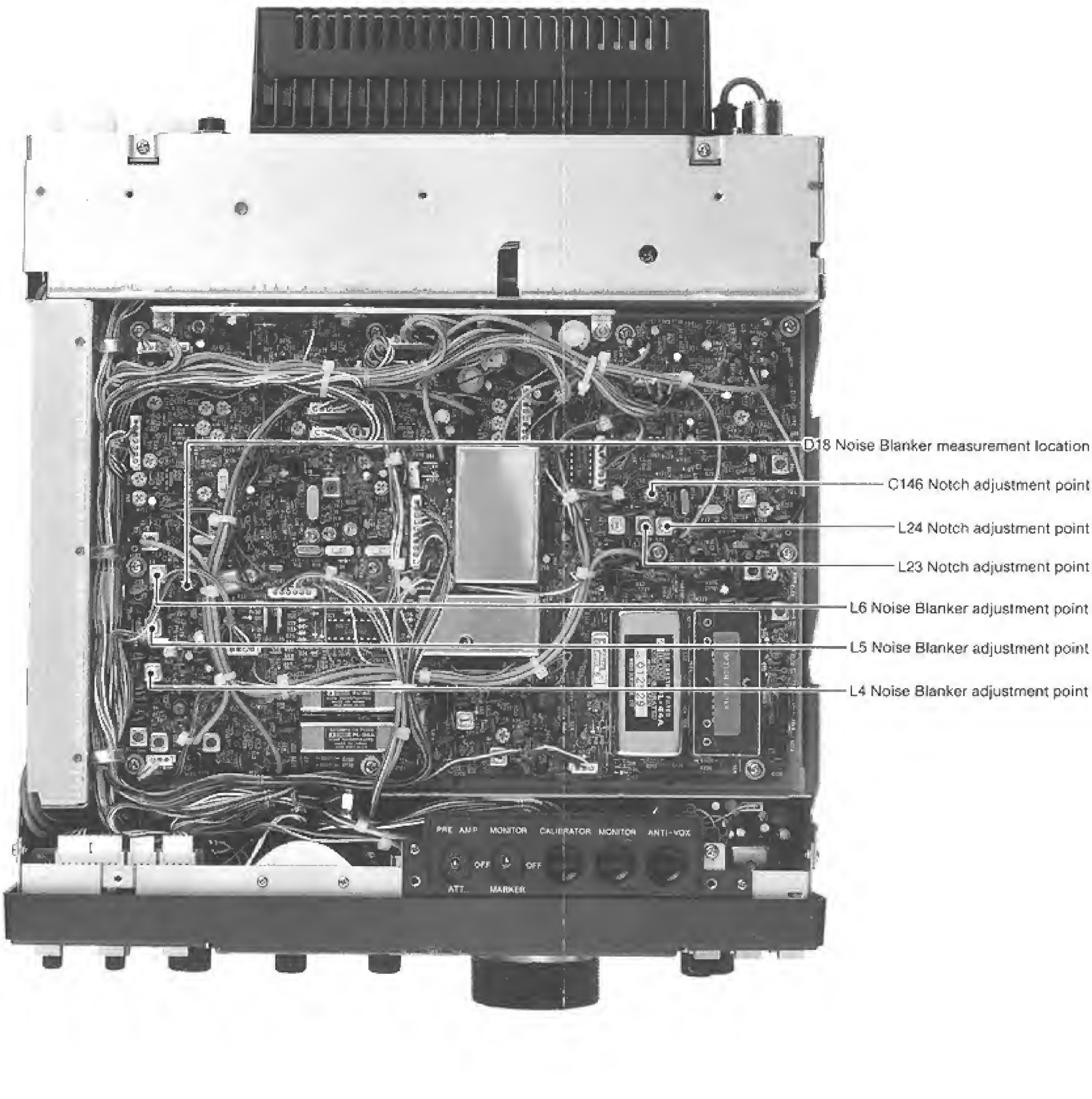
MAIN UNIT


R121 S-Meter adjustment point
R125 S-Meter adjustment point
R442 S-Meter adjustment point
L26 Total Gain adjustment point
R259 Total Gain measurement location and adjustment point
L25 Total Gain adjustment point
L22 Total Gain adjustment point
L18 Total Gain adjustment point
L12 Total Gain adjustment point
L11 Total Gain adjustment point
L10 Total Gain adjustment point
PRE AMP
MONITOR
CALIBRATOR
MONITOR
ANTI-VOX
OFF
OFF
ATT
MARKER

RECEIVER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
S-METER	4	• Apply a −33dBm (5mV) RF signal to the ANTENNA CONNECTOR.	FRONT PANEL		Record the reading.		
		• PRE AMP SWITCH: ON			A position 10dB up on the S-Meter		Verify
		• ATT SWITCH: ON			A position 20dB down on the S-Meter		
NOISE BLANKER	1	• Frequency display: 14MHz • USB mode • PRE AMP SWITCH: OFF • NB WIDE SWITCH: ON • NB LEVEL CONTROL: MAX. CW • Apply pulse-type noise to the ANTENNA CONNECTOR.	MAIN	Connect an oscilloscope to D18.	Adjust to MAX. wave-form on the oscilloscope.	MAIN	L4~L6
		NOTE: The noise blanker will not function for wide noises (pulse width approx. 5m secs.) when the NB WIDE SWITCH is turned OFF. The noise blanker will function when receiving narrow noises (pulse width approx. 0.4 ~ 0.5m secs.) regardless of the position of the NB WIDE SWITCH.					
NOTCH	1	• Frequency display: 14.1485MHz • MARKER SWITCH: ON • NOTCH SWITCH: ON • NOTCH CONTROL: MAX. CW and CCW.	FRONT PANEL		S-Meter remains at the same level when the NOTCH CONTROL is turned fully CW or CCW.	MAIN	L24
	2	• NOTCH SWITCH: OFF	REAR PANEL	Connect an AC milli-voltmeter to the EXT. SP JACK.	2.5V	FRONT PANEL	AF GAIN CONTROL
		• NOTCH SWITCH: ON			Less than 150mV	FRONT PANEL	NOTCH CONTROL
						MAIN	C146
		NOTE: Repeat steps 2 and 3 (below) two or three times.					
	3	• Frequency display: 14.1472MHz • NOTCH SWITCH: ON • NOTCH CONTROL: MAX. CCW	REAR PANEL	Connect an AC milli-voltmeter to the EXT. SP JACK.	MIN. audio output	MAIN	L23
	4	• Frequency display: 14.1498MHz		Connect an AC milli-voltmeter to the EXT. SP JACK.	MIN. level	FRONT PANEL	NOTCH CONTROL
					NOTE: Verify the NOTCH CONTROL position as shown below. PBT ⊖ NOTCH 		

MAIN UNIT


D18 Noise Blanker measurement location
C146 Notch adjustment point
L24 Notch adjustment point
L23 Notch adjustment point
L6 Noise Blanker adjustment point
L5 Noise Blanker adjustment point
L4 Noise Blanker adjustment point
PRE AMP
MONITOR
CALIBRATOR
MONITOR
ANTI-VOX
OFF
OFF
ATT.
MARKER

6 - 5 TRANSMITTER ADJUSTMENT

TEST INSTRUMENTS REQUIRED

(1) AC POWER SUPPLY
- Output voltage : 13.8V DC
- Current capacity : 25A or more

(2) RF POWER METER (TERMINATED TYPE)
- Measuring range : 20 ~ 200W
- Frequency range : 1.8 ~ 30MHz
- Impedance : 50Ω
- SWR : 1.1

(3) AF GENERATOR (AG)
- Frequency range : 200 ~ 3000Hz
- Output level : 0 ~ 300mV

(4) AC MILLI-VOLTMETER
- Measuring range : 10mV ~ 3V

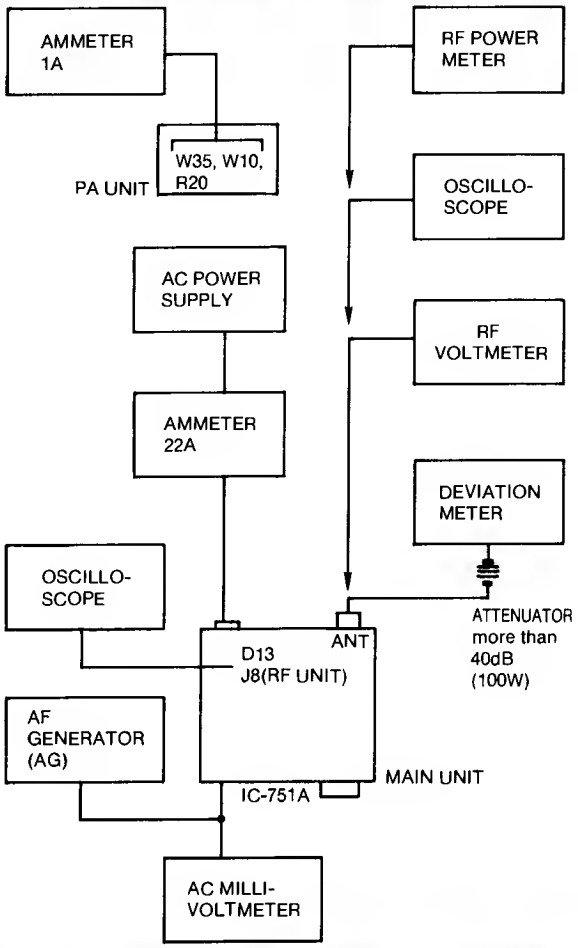
(5) RF VOLTMETER
- Frequency range : 0.1 ~ 80MHz
- Measuring range : 0.01 ~ 10V

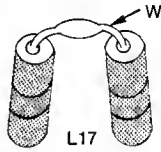
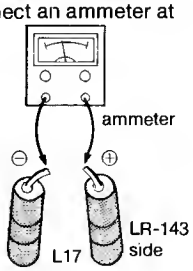
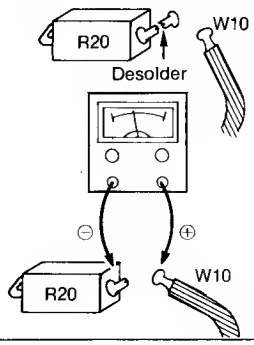
(6) OSCILLOSCOPE
- Frequency range : DC ~ 20MHz
- Measuring range : 0.01 ~ 10V

(7) AMMETER
- Measurement capability to : 1A and 25A

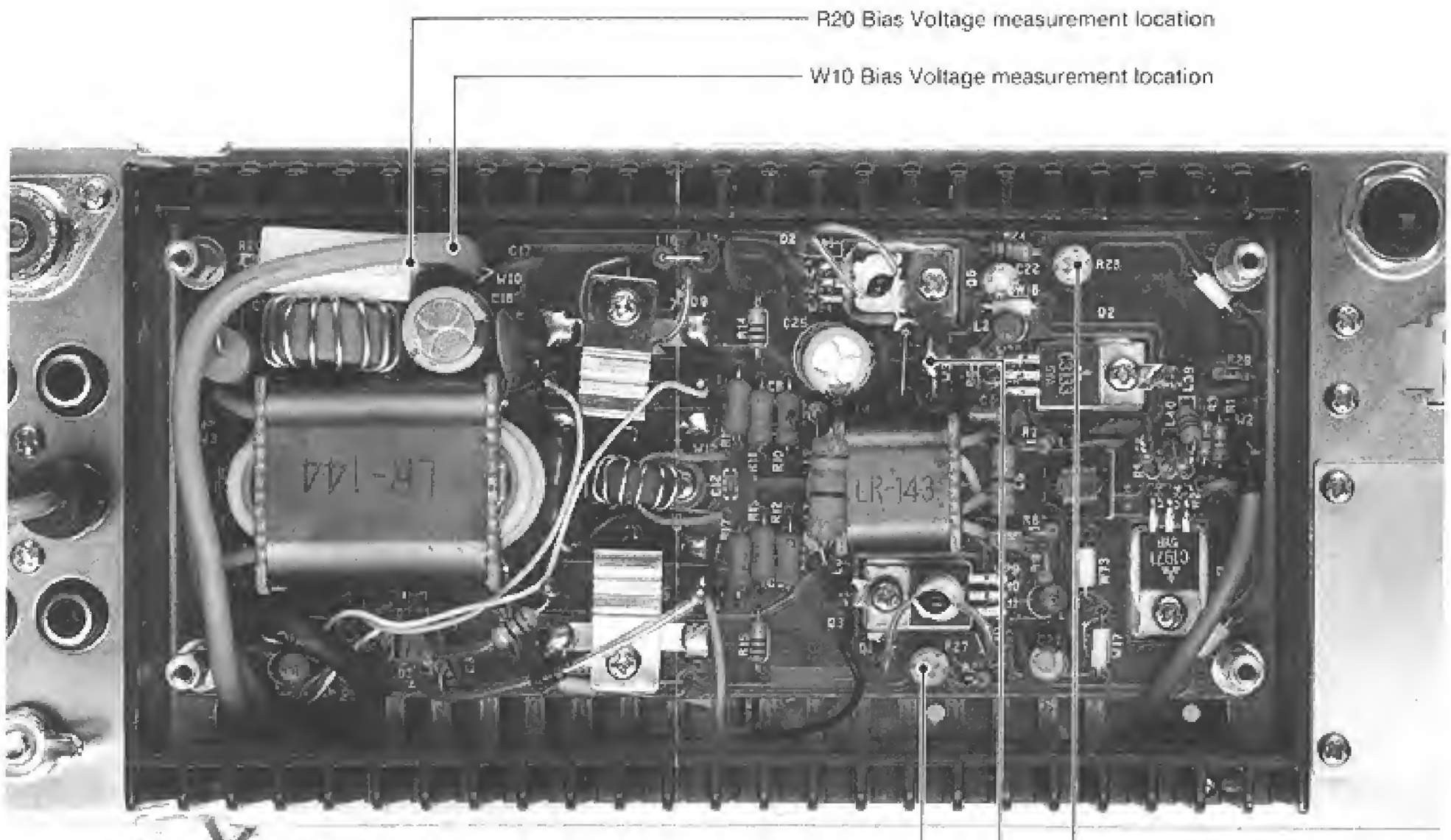
(8) FM DEVIATION METER
- Frequency minimum : 30MHz
- Measuring range : 0 ~ ±5kHz
- De-emphasis : OFF

MEASUREMENT CONNECTION LOCATION



ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT UNIT	MEASUREMENT LOCATION	VALUE	ADJUSTMENT POINT UNIT	ADJUSTMENT POINT ADJUST
BIAS VOLTAGE Ⓐ For driver transistors	1	• Frequency display: 14MHz • SSB mode • MIC GAIN CONTROL: Turn fully CCW • After confirming there is no MIC input, set the transceiver in transmit mode. **NOTE:** Resolder after making adjustments in steps 1 and 2.	PA	Desolder the center of W35.  Connect an ammeter at W35. 	100mA	PA	R27
Ⓑ For final transistors	2			Desolder R20 and connect an ammeter between W10 and R20. 	600mA		R23

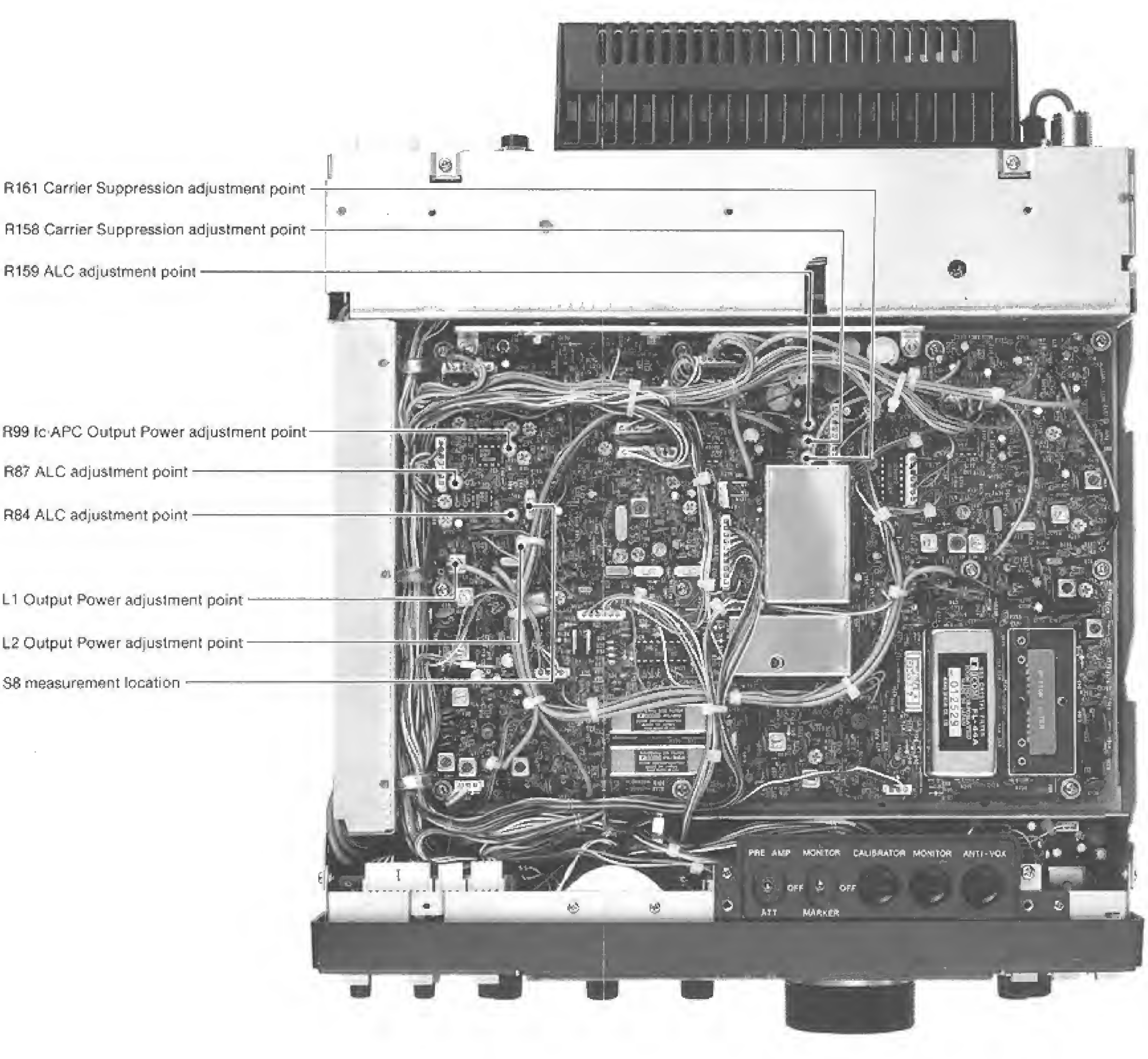
PA UNIT


R20 Bias Voltage measurement location
W10 Bias Voltage measurement location
R27 Bias voltage adjustment point
for driver transistors
W35 Bias Voltage measurement location
R23 Bias voltage adjustment point
for final transistors

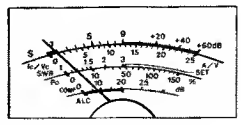
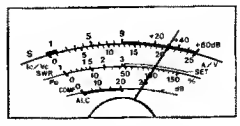
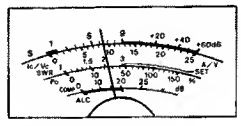
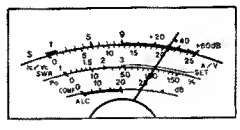
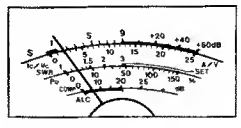
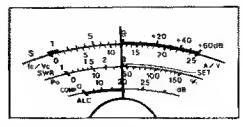
TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
OUTPUT POWER	1	• Frequency display: 14MHz • USB mode • COMP SWITCH: OFF • Apply a 1.5kHz/3mV signal from the AG, then adjust the MIC GAIN CONTROL to output 30W of power.	REAR PANEL	Connect an RF power meter to the ANTENNA CONNECTOR. AC MILLI-VOLTMETER / AF GENERATOR (AG) PIN 1 PIN 7 PIN 6 PIN 5 PIN 1: AG input PIN 7: GND PIN 5: Jumper PIN 6: Jumper	Adjust to obtain MAX. output power.	MAIN	L1
	2	• FM mode • MIC GAIN CONTROL: MAX. CCW			50W	FRONT PANEL	RF POWER CONTROL
		• MIC GAIN CONTROL: MAX. CW Note: The RF POWER CONTROL should remain in the same position as in step 2 above.			MAX. output	MAIN	L2
Ic • APC	1	• Frequency display: 14MHz • RTTY mode • RF POWER CONTROL: MAX. CW • Transmit mode	REAR PANEL	Connect an ammeter to the power cable.	22A	MAIN	R99
ALC	1	• Frequency display: 14MHz • RTTY mode • RF POWER CONTROL: MAX. CW	REAR PANEL	Connect an RF power meter to the ANTENNA CONNECTOR.	100W	MAIN	R87
	2	• RF POWER CONTROL: MAX. CCW			3~10W		Verify
		NOTE: Check that the RF output power on each band is 90 ~ 100W and that the current drain is less than 20A.					
	3	• RF POWER CONTROL: MAX. CW • S8 on MAIN UNIT: Switch to rear panel side. • Transmit mode	REAR PANEL	Connect an RF power meter to the ANTENNA CONNECTOR.	50W	MAIN	R84
	4	• RF POWER CONTROL: MAX. CW • AM mode • MIC GAIN CONTROL: (set as shown) MIC GAIN RF PWR		Connect an oscilloscope to the ANTENNA CONNECTOR.	100% modulation or 50W RF output power		R159
	5	• MIC GAIN CONTROL: MAX. CCW		Connect an RF power meter to the ANTENNA CONNECTOR.	40~60W		Verify
CARRIER SUPPRES-SION	1	• Frequency display: 14MHz • USB and LSB modes • COMP SWITCH: OFF • MIC GAIN CONTROL: MAX. CCW • Transmit mode	REAR PANEL	Connect an RF voltmeter or spectrum analyzer to the ANTENNA CONNECTOR.	Alternately change the operating mode between USB and LSB, and adjust R158 and R161 for MIN. output of less than −50dB.	MAIN	R158 R161
	2	• COMP SWITCH: ON			Less than −50dB		Verify

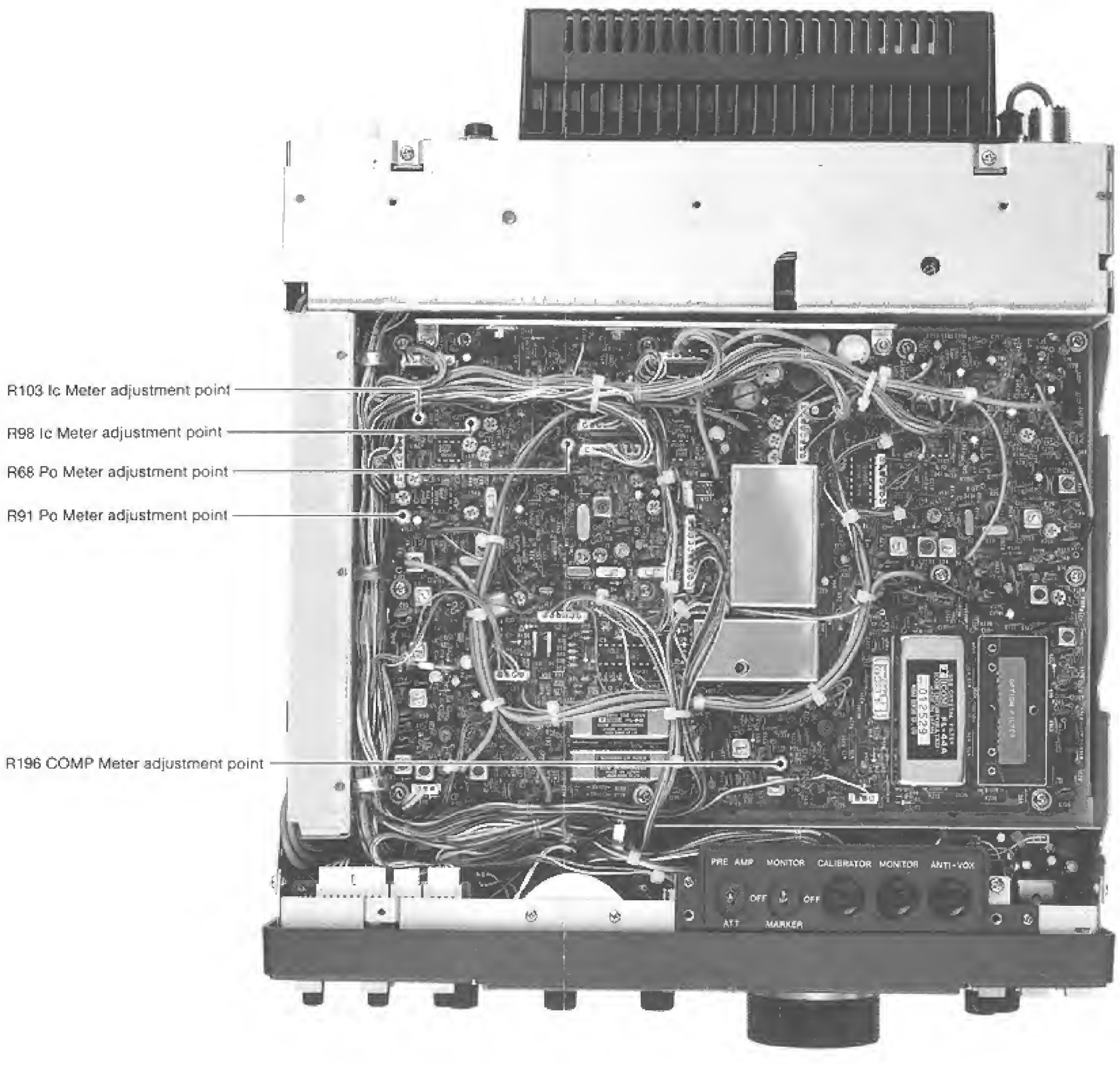
MAIN UNIT


R161 Carrier Suppression adjustment point
R158 Carrier Suppression adjustment point
R159 ALC adjustment point
R99 Ic APC Output Power adjustment point
R87 ALC adjustment point
R84 ALC adjustment point
L1 Output Power adjustment point
L2 Output Power adjustment point
S8 measurement location
PRE AMP
MONITOR
CALIBRATOR
MONITOR
ANTI-VOX
OFF
OFF
ATT
MARKER

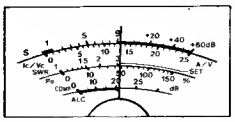
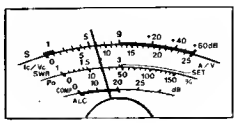
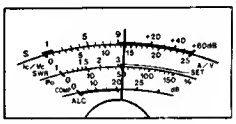
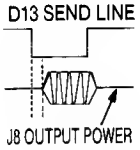
TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
METER Ⓐ Ic METER	1	• Frequency display: 14MHz • RTTY mode • RF POWER CONTROL: MAX. CW • METER SWITCH: Ic • Transmit mode	REAR PANEL	Connect an ammeter to the power cable.	Adjust to total current minus 3A.	MAIN	R98
	2	• HAM/GENE SWITCH: GENE		 Multifunction meter (Ic scale)	1A (Ic scale)		R103
Ⓑ COMP METER	3	• USB mode • COMP SWITCH: ON • METER SWITCH: COMP • Input 2 audio signals into the MIC CONNECTOR: 1.9kHz 3mV 1.3kHz 3mV	FRONT PANEL	 Multifunction meter (COMP scale)	25dB (COMP scale)	FRONT PANEL	MIC GAIN CONTROL
		• METER SWITCH: ALC		 Multifunction meter (Ic scale)	9A (Ic scale)	MAIN	R196
	4	• COMP SWITCH: OFF • METER SWITCH: COMP • Input an audio signal into the MIC CONNECTOR: 1.5kHz 3mV	REAR PANEL	Connect an RF meter to the ANTENNA CONNECTOR.	30W	FRONT PANEL	MIC GAIN CONTROL
		• COMP SWITCH: ON			80~100W		Verify
Ⓒ Po METER	5	• RTTY mode • COMP SWITCH: OFF • METER SWITCH: Po • Transmit mode		Connect an RF meter to the ANTENNA CONNECTOR.	100W		RF POWER CONTROL
			FRONT PANEL	 Multifunction meter (Po scale)	100% (Po scale)	MAIN	R91
Ⓓ ALC METER	6	• USB mode • METER SWITCH: ALC • Apply an AF signal to the MIC CONNECTOR: 1.5kHz 3mV		 Multifunction meter (Ic scale)	2A (Ic scale)	FRONT PANEL	MIC GAIN CONTROL
		• Apply an AF signal to the MIC CONNECTOR: 1.5kHz 9.4mV (10dB up)		 Multifunction meter (ALC scale)	Full scale in the ALC zone	MAIN	R68

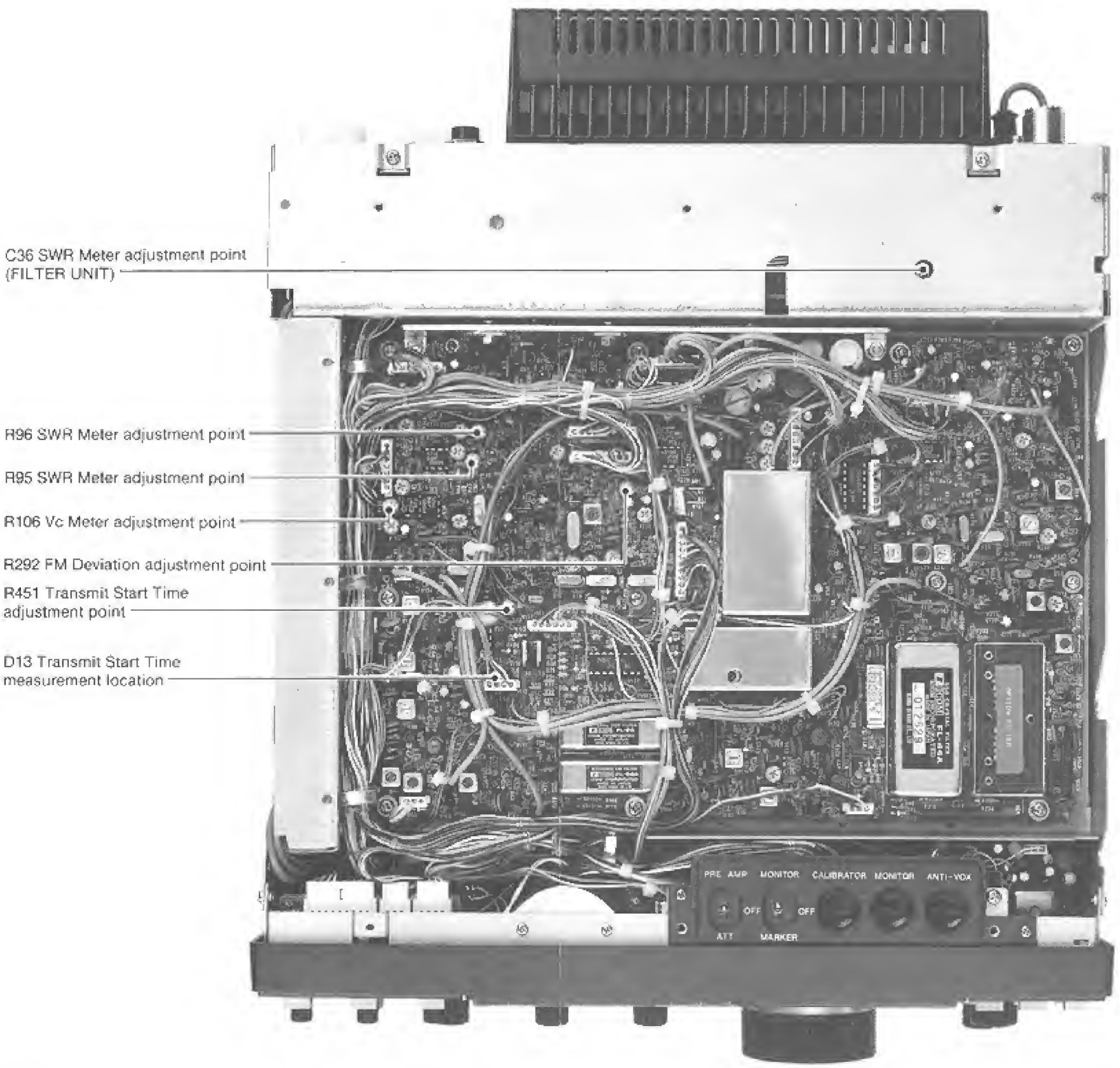
MAIN UNIT


R103 Ic Meter adjustment point
R98 Ic Meter adjustment point
R66 Po Meter adjustment point
R91 Po Meter adjustment point
R196 COMP Meter adjustment point
PRE AMP
MONITOR
CALIBRATOR
MONITOR
ANTI-VOX
OFF
OFF
ATT
MARKER

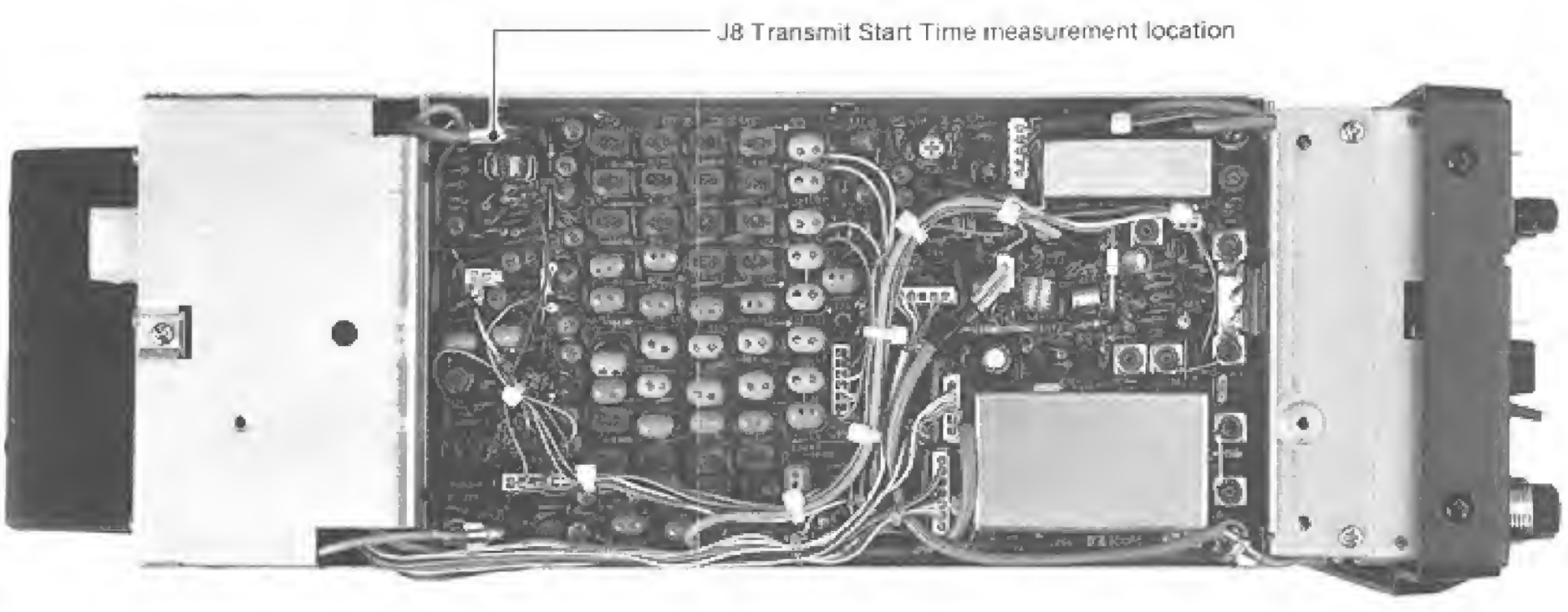
TRANSMITTER ADJUSTMENT

ADJUSTMENT		ADJUSTMENT CONDITIONS	MEASUREMENT		VALUE	ADJUSTMENT POINT	
			UNIT	LOCATION		UNIT	ADJUST
⑤SWR METER	6	• Frequency display: 14MHz • RTTY mode • METER SWITCH: Po • Transmit mode	FRONT PANEL	Po METER  Multifunction meter (SWR scale)	Adjust RF POWER CONTROL until the meter needle is at "SWR SET".	FRONT PANEL	RF POWER CONTROL
		• METER SWITCH: SWR • Transmit mode		SWR METER	Adjust to MIN. SWR (less than 1.2).	FILTER	C36
	7	• Connect a 100Ω or 25Ω dummy load to the ANTENNA CONNECTOR • Transmit mode		SWR METER  Multifunction meter (SWR scale)	SWR 2	MAIN	R96
	8	• Remove any connection to the ANTENNA CONNECTOR • Transmit mode			SWR 3		R95
⑥Vc METER	9	• SSB mode • MIC GAIN CONTROL: fully CCW • METER SWITCH: Vc • No MIC input • Transmit mode		Vc METER  Multifunction meter (Vc scale)	13.8V		R106
⑦SWR APC	10	• RTTY mode • RF POWER CONTROL: MAX. • Remove any connection to the ANTENNA CONNECTOR	REAR PANEL	Connect an ammeter between the AC POWER SUPPLY and the transceiver.	Less than 12A		Verify
TRANSMIT START TIME	1	• CW mode • VOX SWITCH: ON • KEYER SPEED CONTROL: MAX. CW • VOX DELAY CONTROL: MAX. CCW • Key down to dot position	MAIN	Connect lead of an oscilloscope to the cathode of D13.	19ms D13 SEND LINE  J8 OUTPUT POWER	MAIN	R451
			RF	Connect other lead of an oscilloscope to J8.			
FM DEVIATION	1	• Frequency display: 28MHz • FM mode • MIC GAIN CONTROL: MAX. CW • Apply an AF signal to the MIC CONNECTOR at 1.0kHz 10mV	REAR PANEL	Connect a deviation meter to the ANTENNA CONNECTOR through an attenuator.	±4.7kHz	MAIN	R292

MAIN UNIT

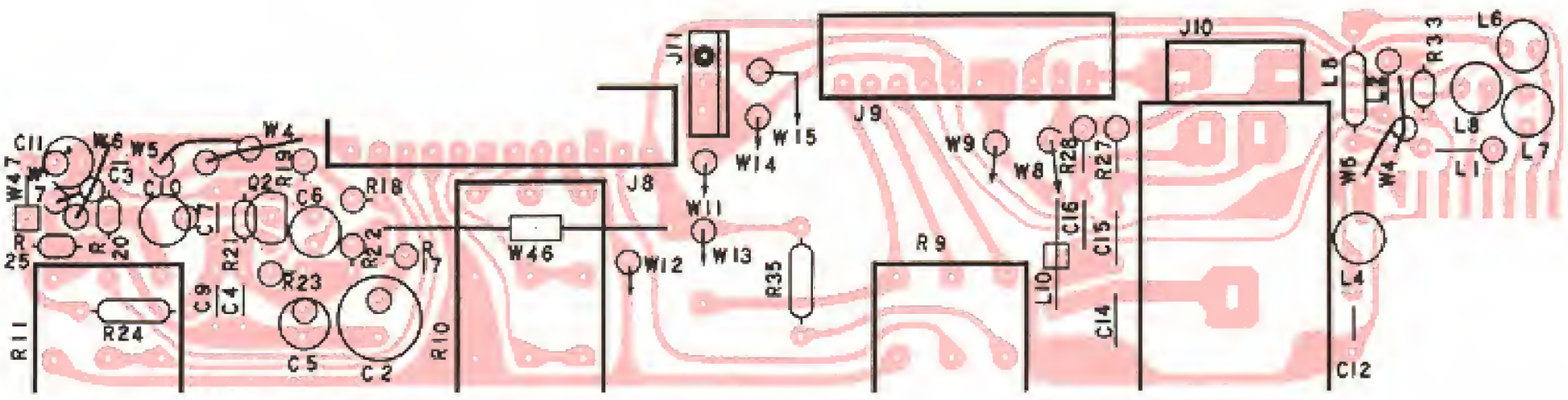


RF UNIT



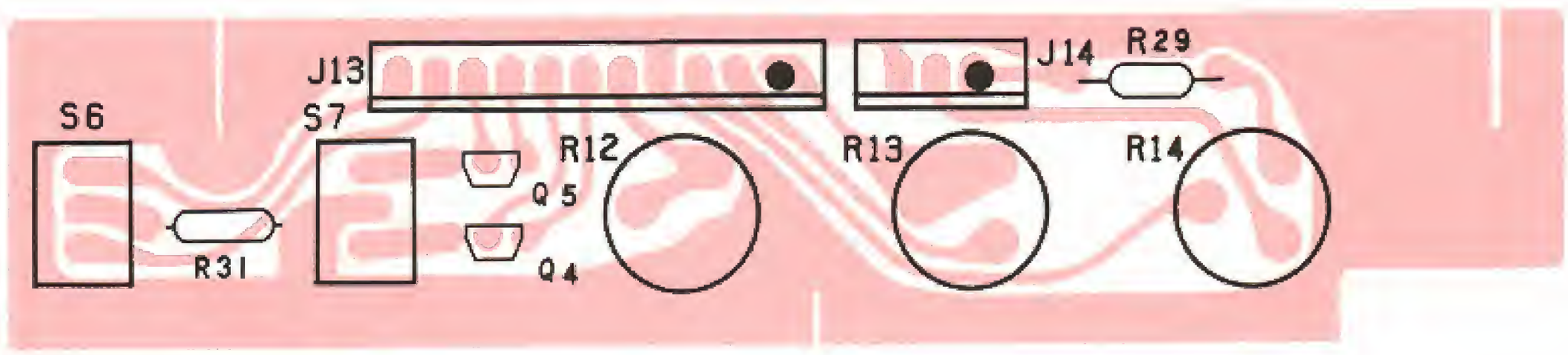
SECTION 7 BOARD LAYOUTS

7 - 1 FRONT AF UNIT

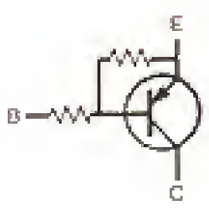


Q2
2SC1571-G

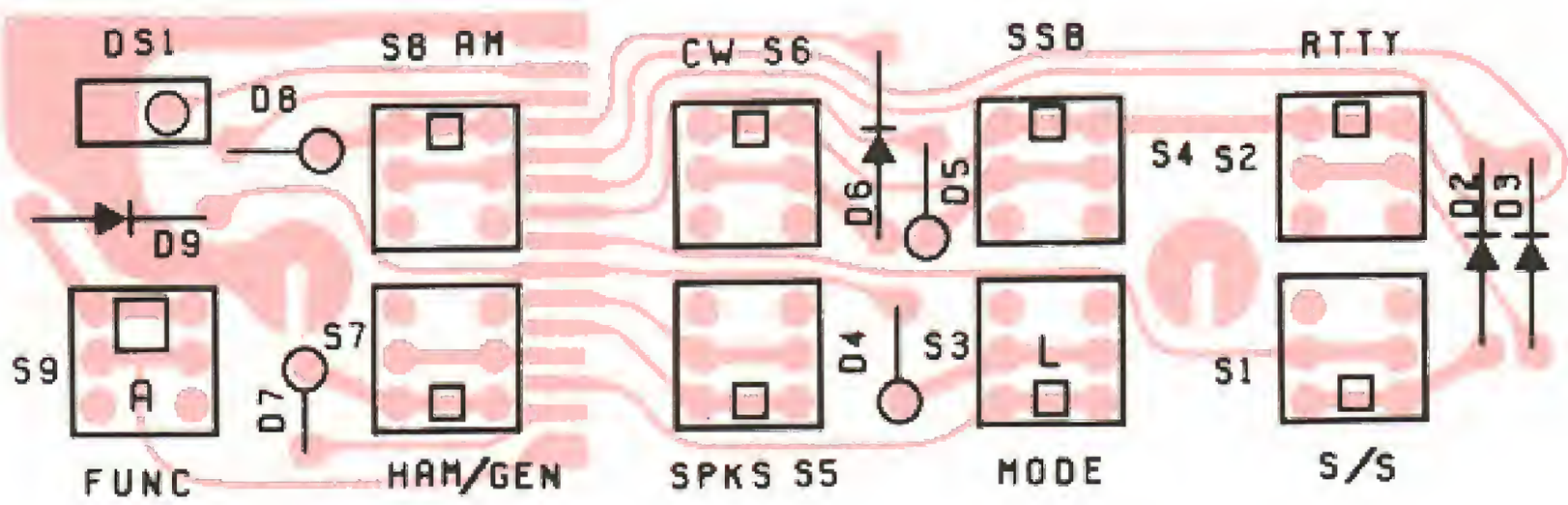
7 - 2 FRONT MARKER UNIT



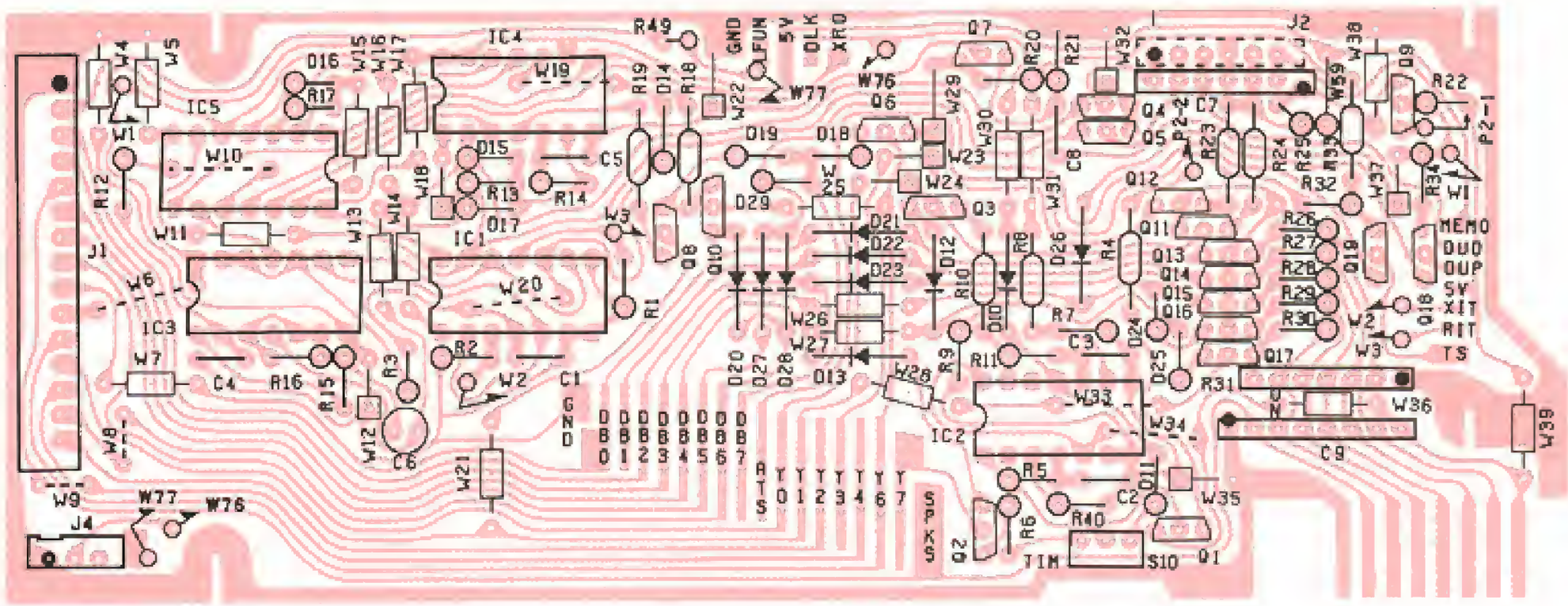
Q4, Q5
2SA1346



7 - 3 FRONT MODE SWITCH UNIT

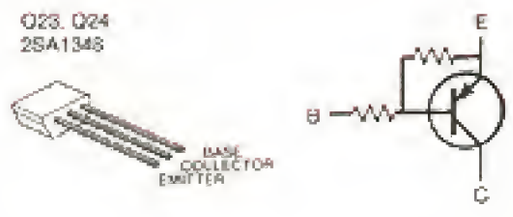


7 - 4 MATRIX UNIT

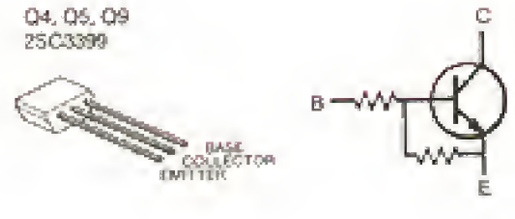


Q2, Q3, Q6, Q8, Q10, Q13~Q19
2SC2458-GR

Q23, Q24
2SA1348



Q4, Q5, Q9
2SC3399

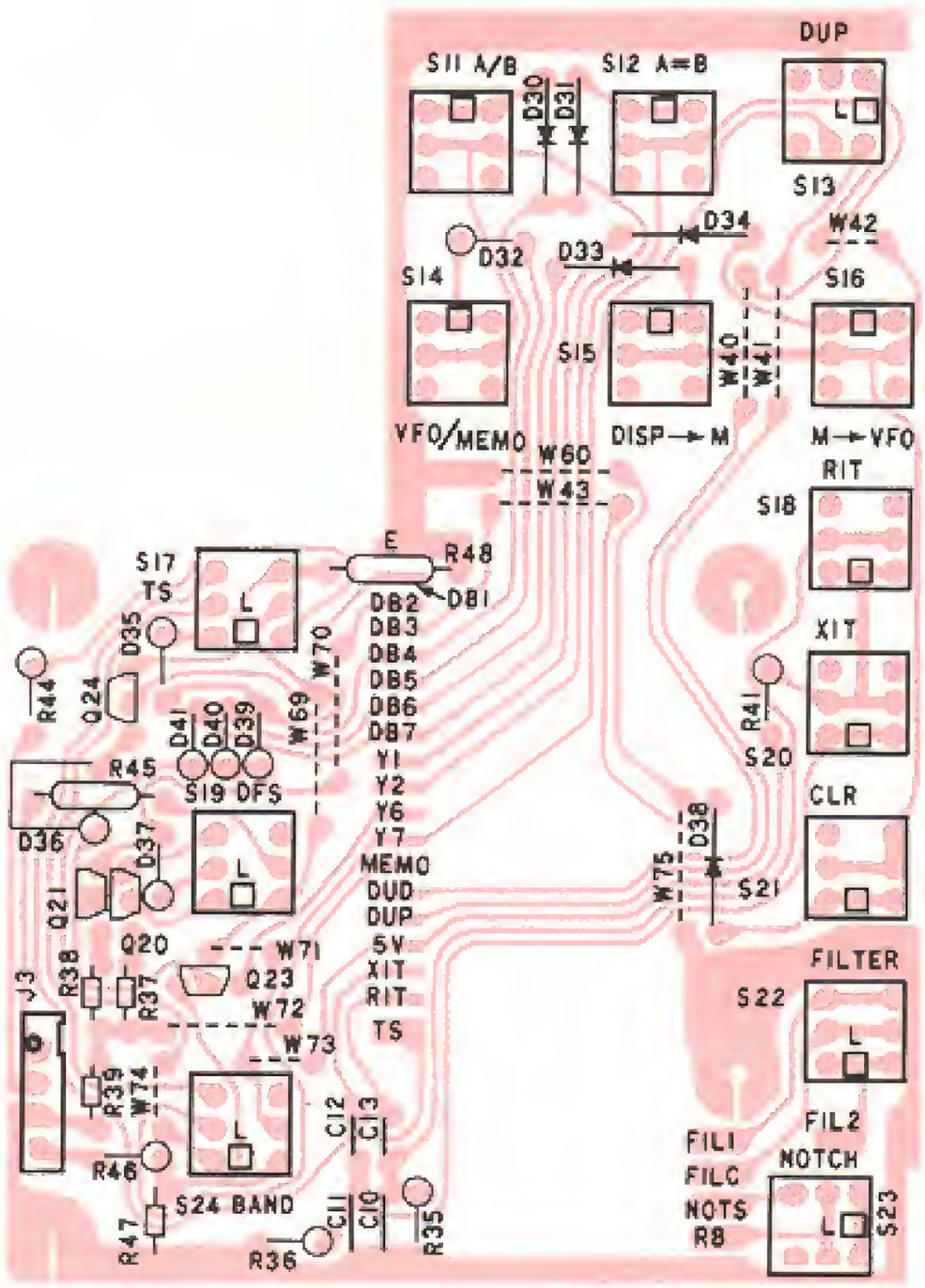


Q1, Q7
2SA1048

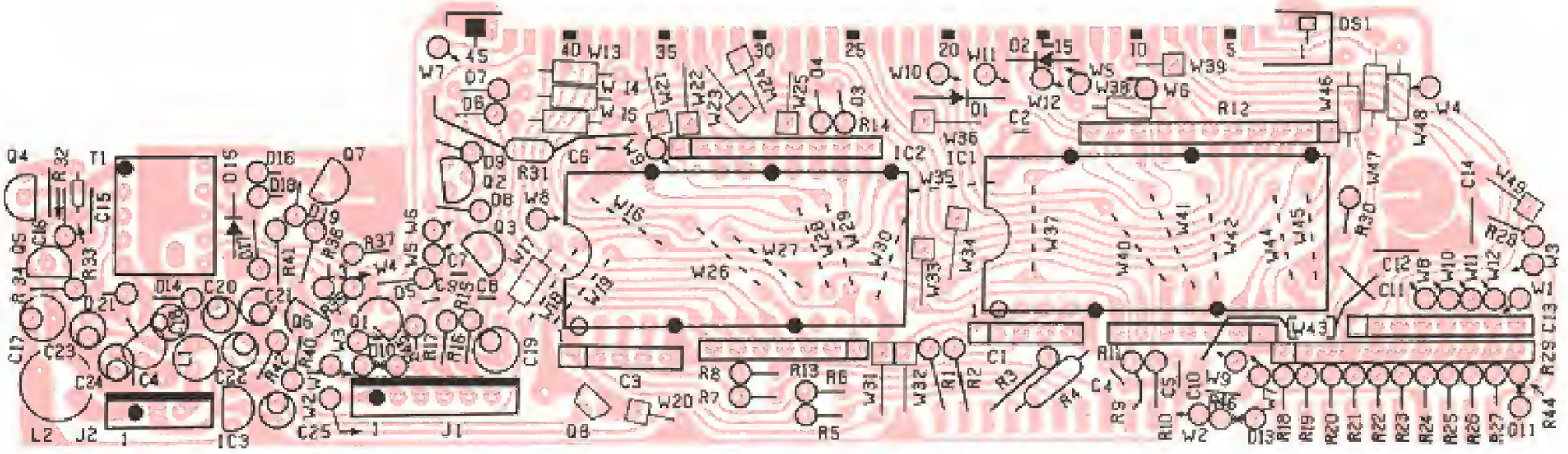
7 - 5 MATRIX SWITCH UNIT

Q20
2SA1048

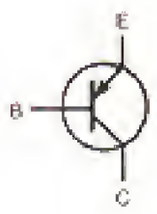
Q21
2SC2458-GR



7 - 6 DISPLAY UNIT



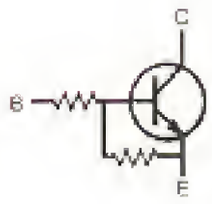
Q1, Q2, Q3, Q6
2SA1015-Y



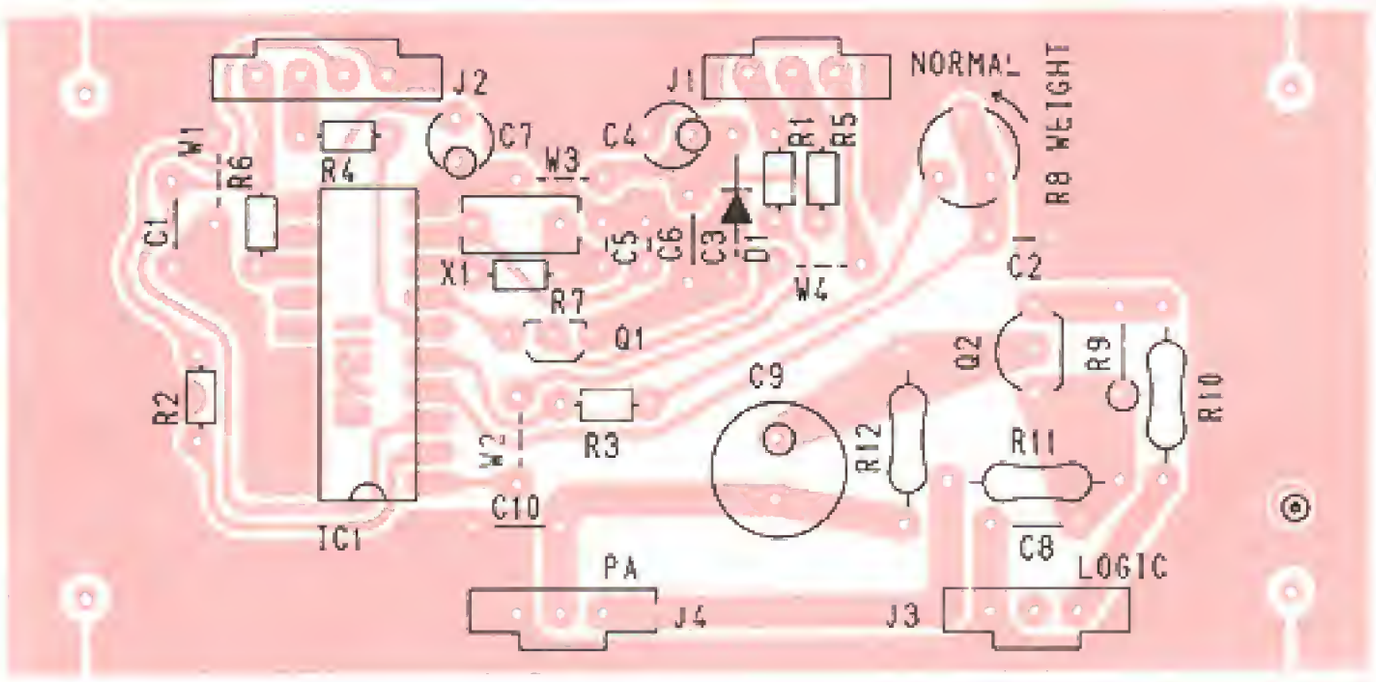
Q4, Q5
2SC1214

Q7
2SC2458-GR

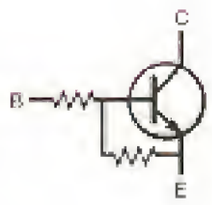
Q8
2SC3402



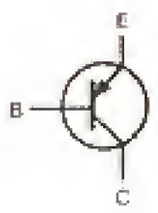
7 - 7 KEYER UNIT



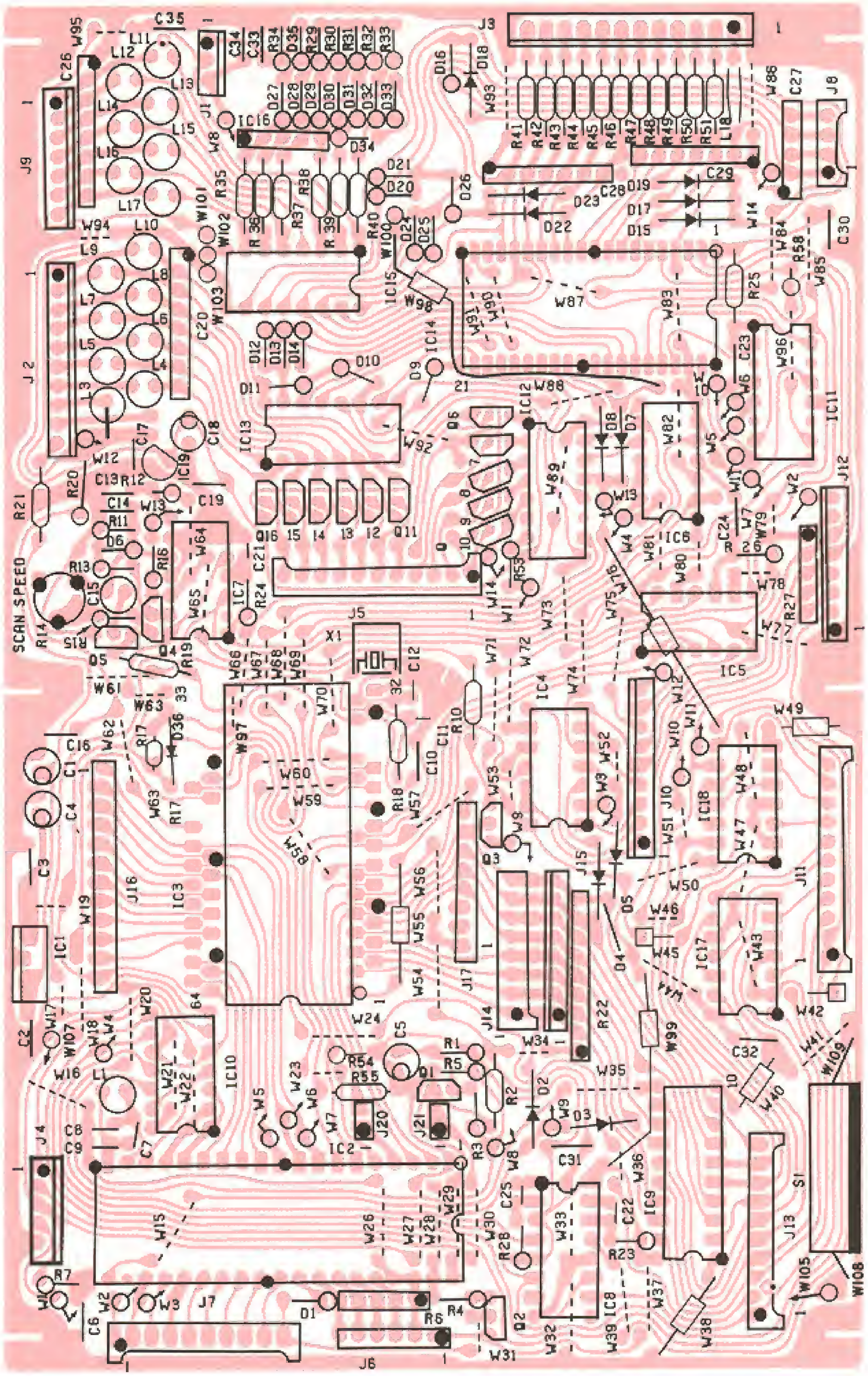
Q1
2SC3399



Q2
2SB562-C



7 - 8 LOGIC UNIT

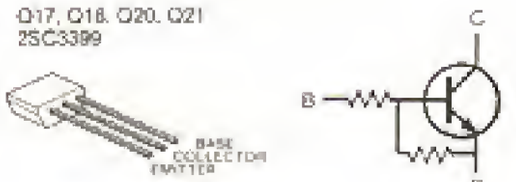


Q1, Q2, Q3
2SA1048-Y

Q4, Q5
2SC2458-GR

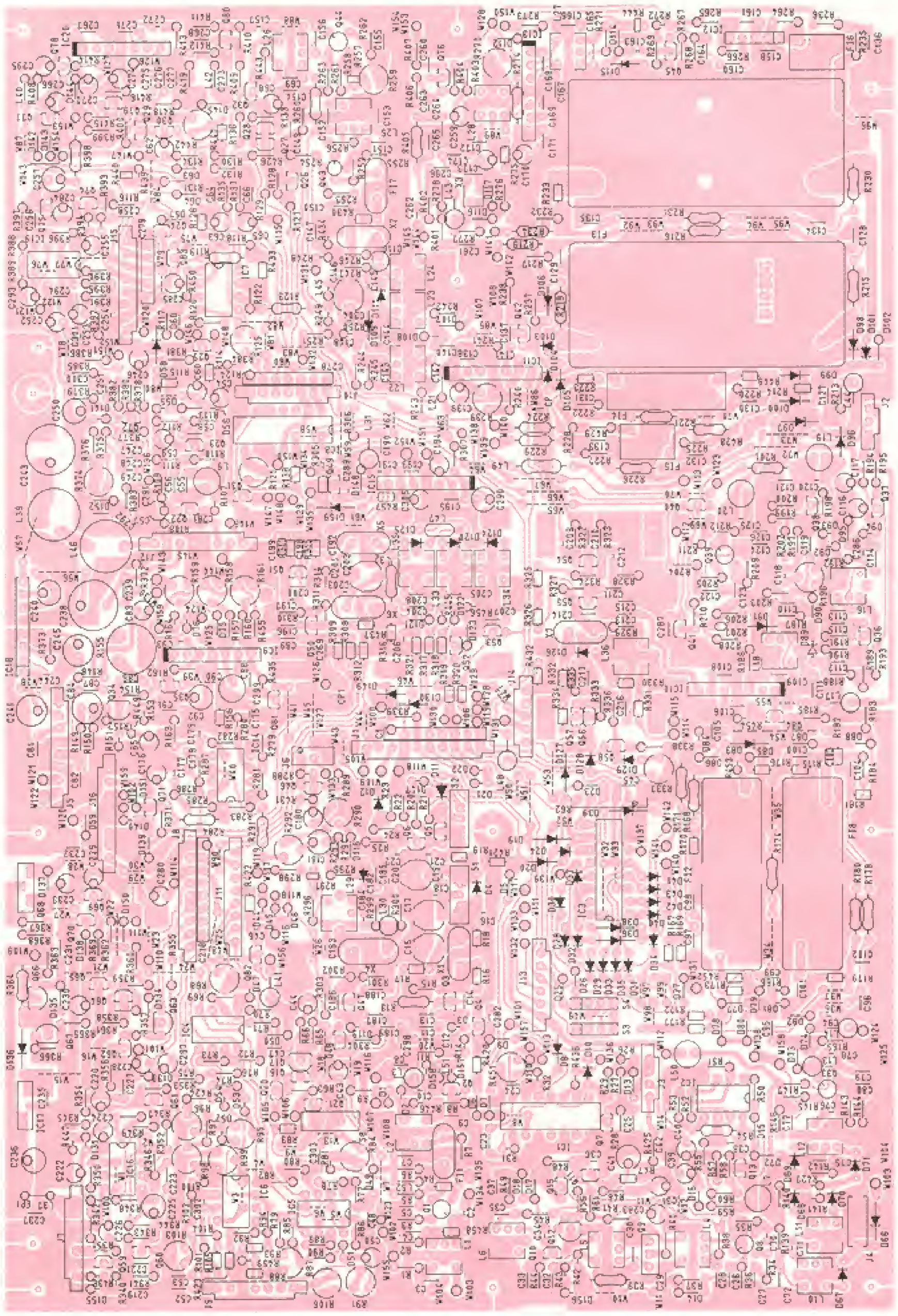
Q6~Q16
2SA1349

Q17, Q18, Q20, Q21
2SC3399

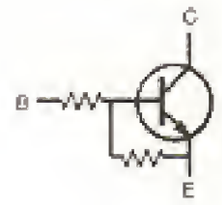


Q19
2SB562-C

7 - 9 MAIN UNIT

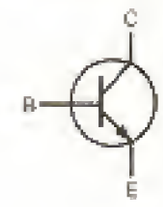


Q4, Q5, Q20, Q21, Q25, Q41, Q48, Q52, Q53, Q56 Q57, Q69, Q74, Q75, Q81
2SC3402

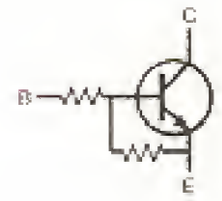


Q6, Q7, Q11, Q22, Q23, Q32, Q35, Q37, Q46, Q60, Q62, Q64, Q65, Q67, Q70, Q76, Q78, Q79
2SC2458

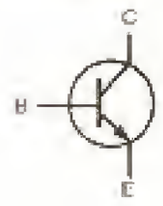
Q12, Q15, Q17
2SC2878



Q29, Q31, Q40
Q71, Q77, Q83
2SC3399



Q34
2SC1571



Q63, Q66
2SD468-C

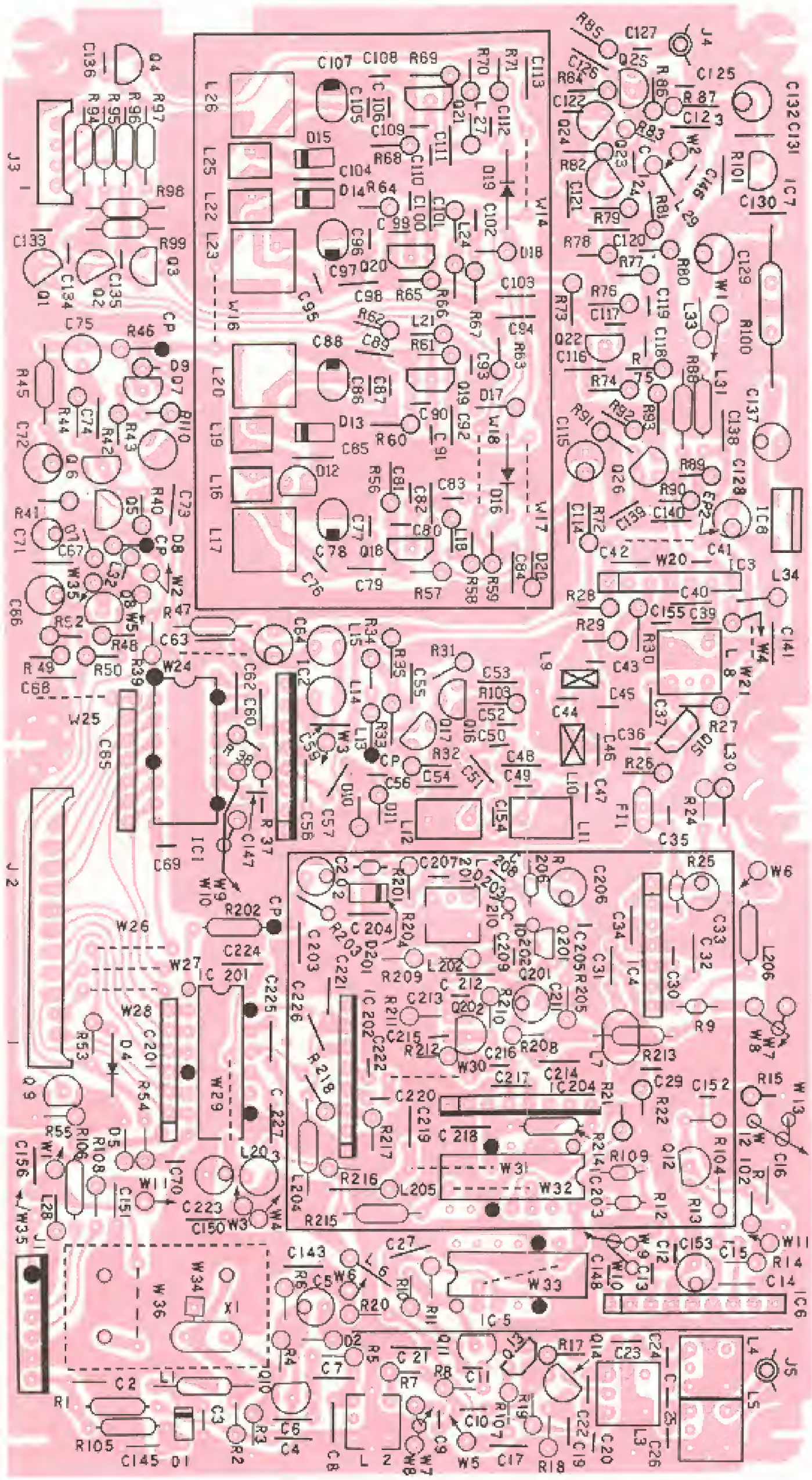
Q68
2SD880-Y

Q2, Q49
2SK241-Y

Q13, Q26, Q27, Q28, Q58, Q61, Q62
2SA1048-GR

Q1, Q8, Q33, Q39, Q43, Q44
3SK74-M (FET)

7 - 10 PLL UNIT

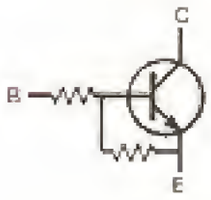


Q1–Q4, Q9, Q10
2SC945-P

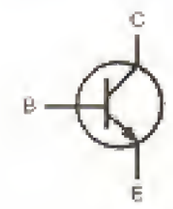
Q7
2SC1571-G

Q11, Q14, Q16, Q17
Q22, Q23, Q25, Q26
2SC383-TM

Q13
2SC3399



Q202
2SC763-C

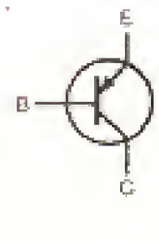


Q5, Q6
2SK30A-Y

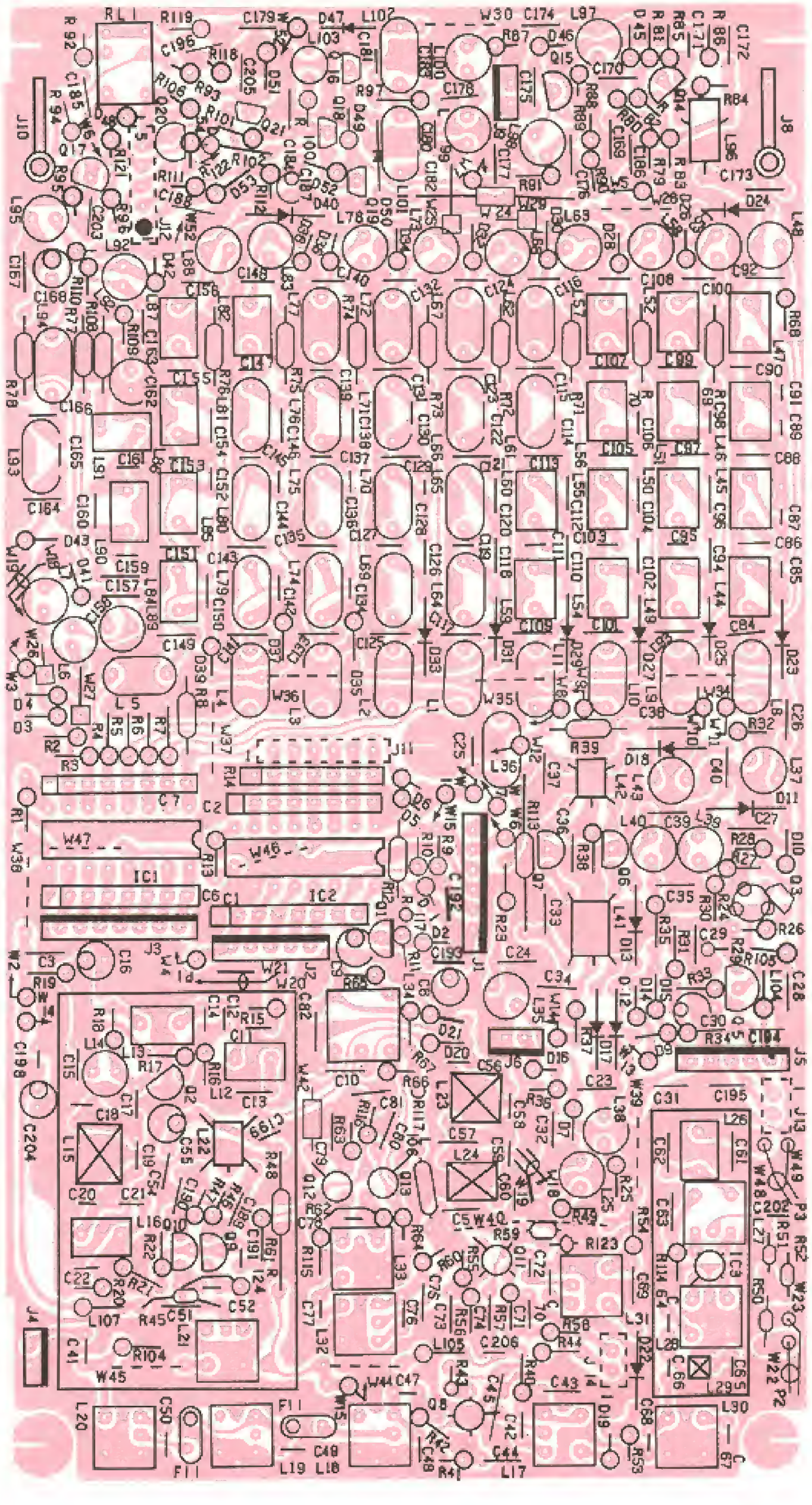
Q201
2SK192A-GR

Q15
2SK241-Y

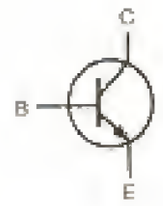
Q8
2SA1015-Y



7 - 11 RF UNIT

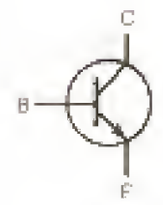


Q1, Q17
2SC945-P/Q



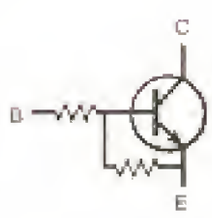
Q2, Q14
2SC2053

Q4
2SC1571



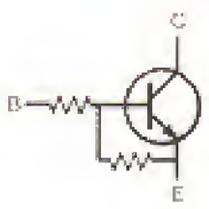
Q15
2SC2878

Q16, Q18, Q19
2SC3402



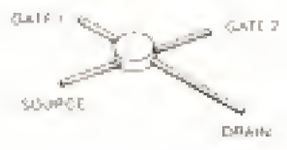
Q20
2SD468-C

Q21
2SC3399

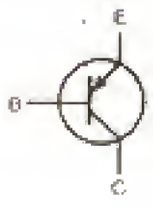


Q6 - Q10
2SK125 (FET)

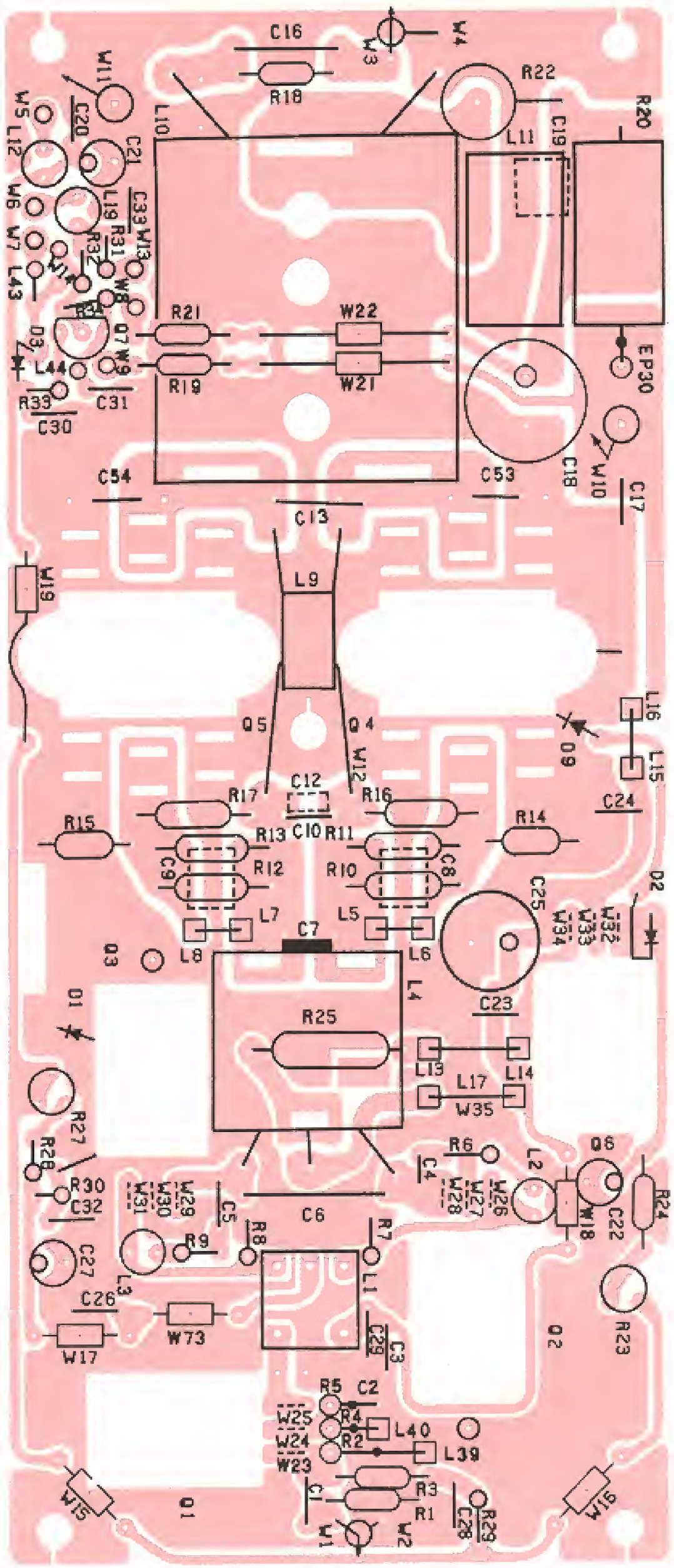
Q11 - Q13
3SK74-M (FET)

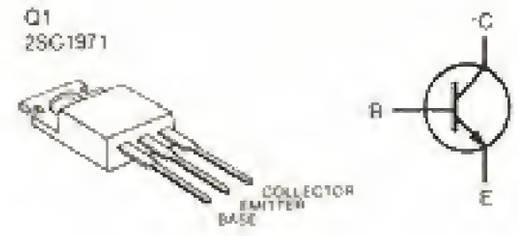


Q3
2SA1048-Y

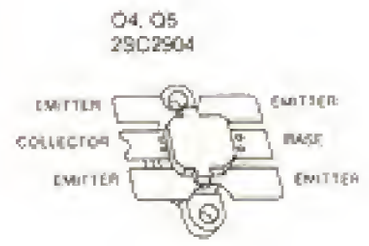


7 - 12 PA UNIT

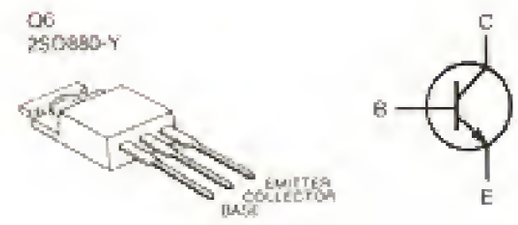

C16
W3
W4
R18
R22
W11
C20
L10
L11
C19
R20
W5
L12
C21
W6
W7
L43
L19
R31
R32
C33
W13
W8
Q7
R21
W22
R19
W21
Q3
L44
R33
C30
C31
EP30
C54
C53
C18
W10
C17
C13
W19
L9
Q5
Q4
W12
X
Q9
L16
L15
C12
C24
R17
R16
R15
R13
C10
R11
R14
C9
R12
R10
C8
C25
D2
L7
L5
C7
L8
L6
W32
W33
W34
D3
D1
L4
C23
R25
L13
L17
L14
W35
R27
R28
R30
C32
W29
W30
W31
C5
C6
R6
C4
W26
W27
W28
L2
Q6
W18
C22
R24
R9
R8
R7
C27
L3
C26
W73
L1
C29
C3
R23
W17
R5
C2
W25
W24
W23
R4
R2
L40
L39
C1
R3
R1
L1
L2
C28
R29
W15
W16
D1
D2


Q1
2SC1971
COLLECTOR
EMITTER
BASE
C
B
E

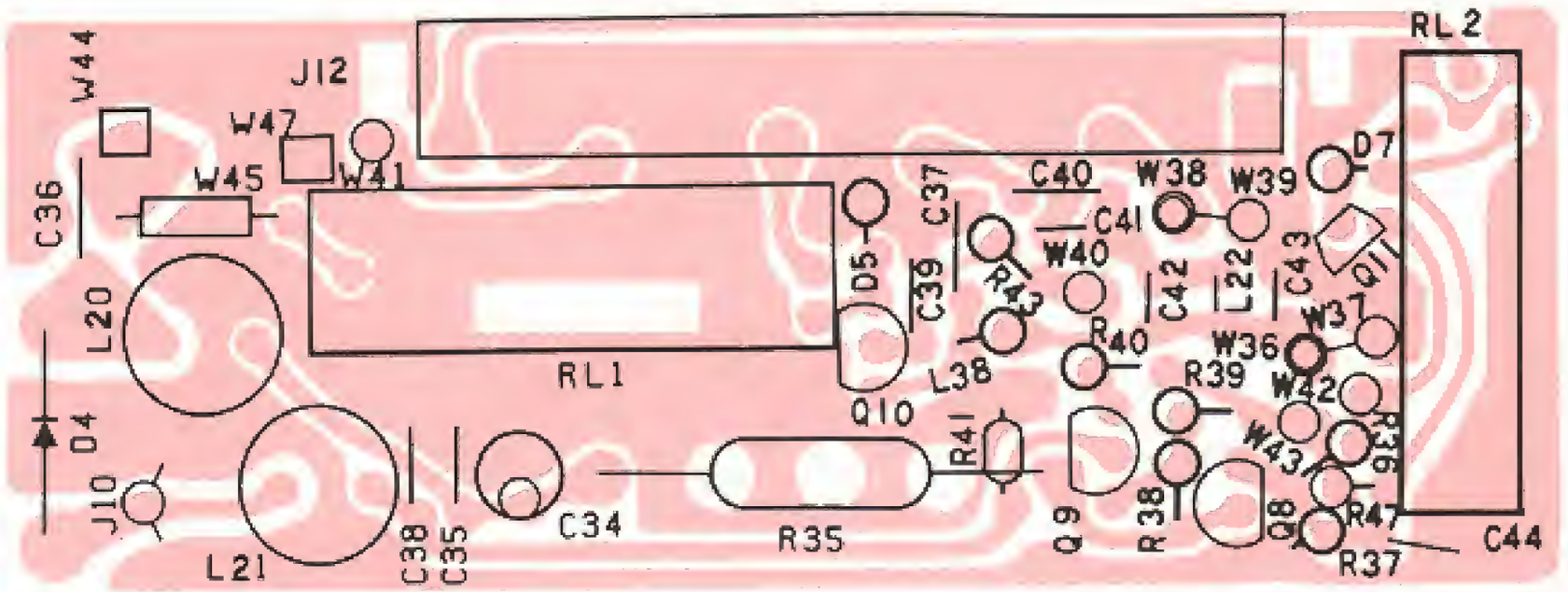

Q2, Q3
2SC3133
COLLECTOR
EMITTER
BASE
C
B
E

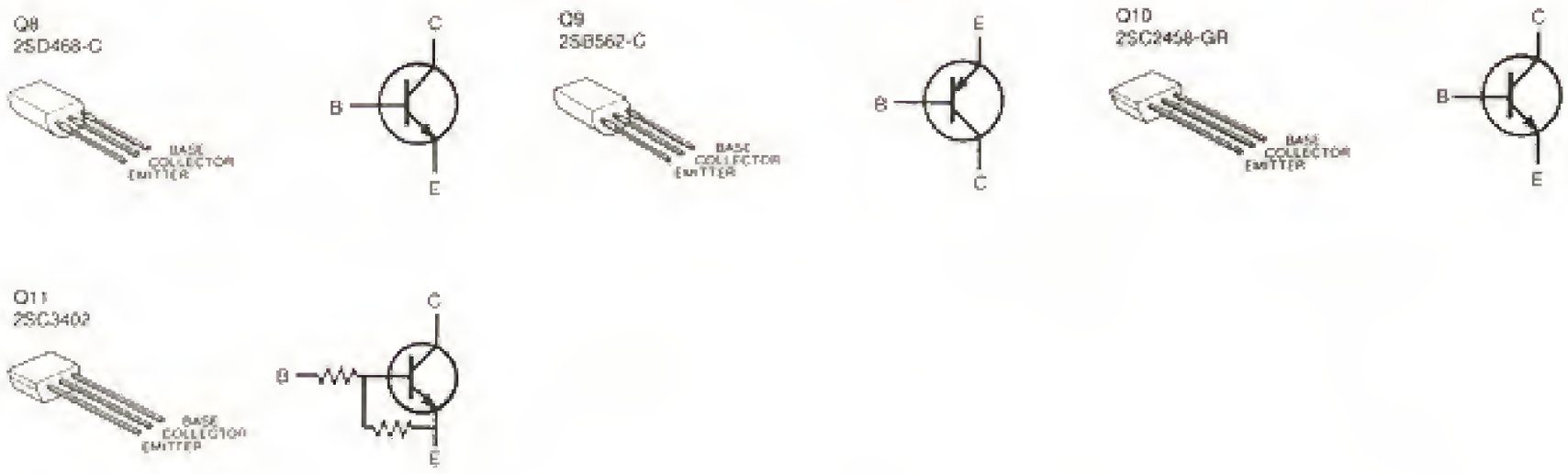

Q4, Q5
2SC2904
EMITTER
COLLECTOR
EMITTER
EMITTER
BASE
EMITTER
C
B
E


Q7
2SC2120
BASE
COLLECTOR
EMITTER
C
B
E

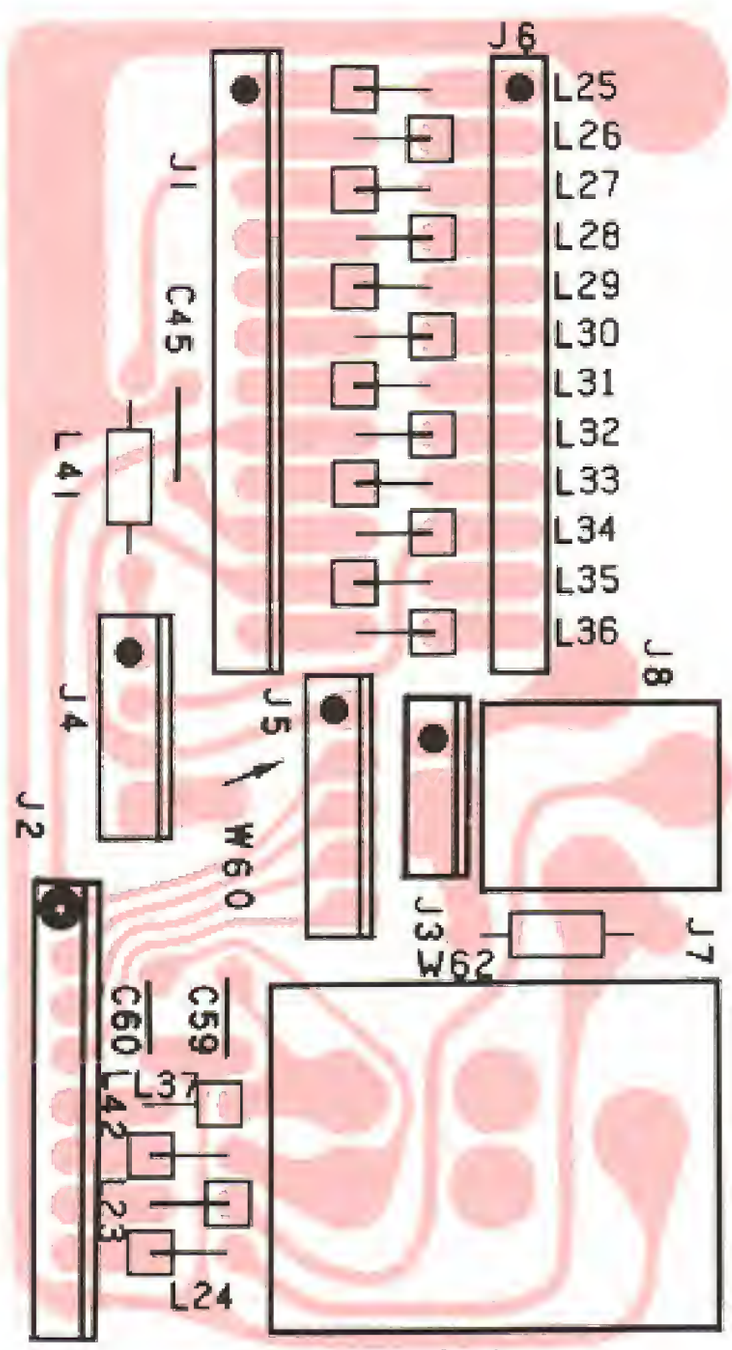

Q6
2SD880-Y
EMITTER
COLLECTOR
BASE
C
B
E

7 - 13 PA CONNECTOR UNIT

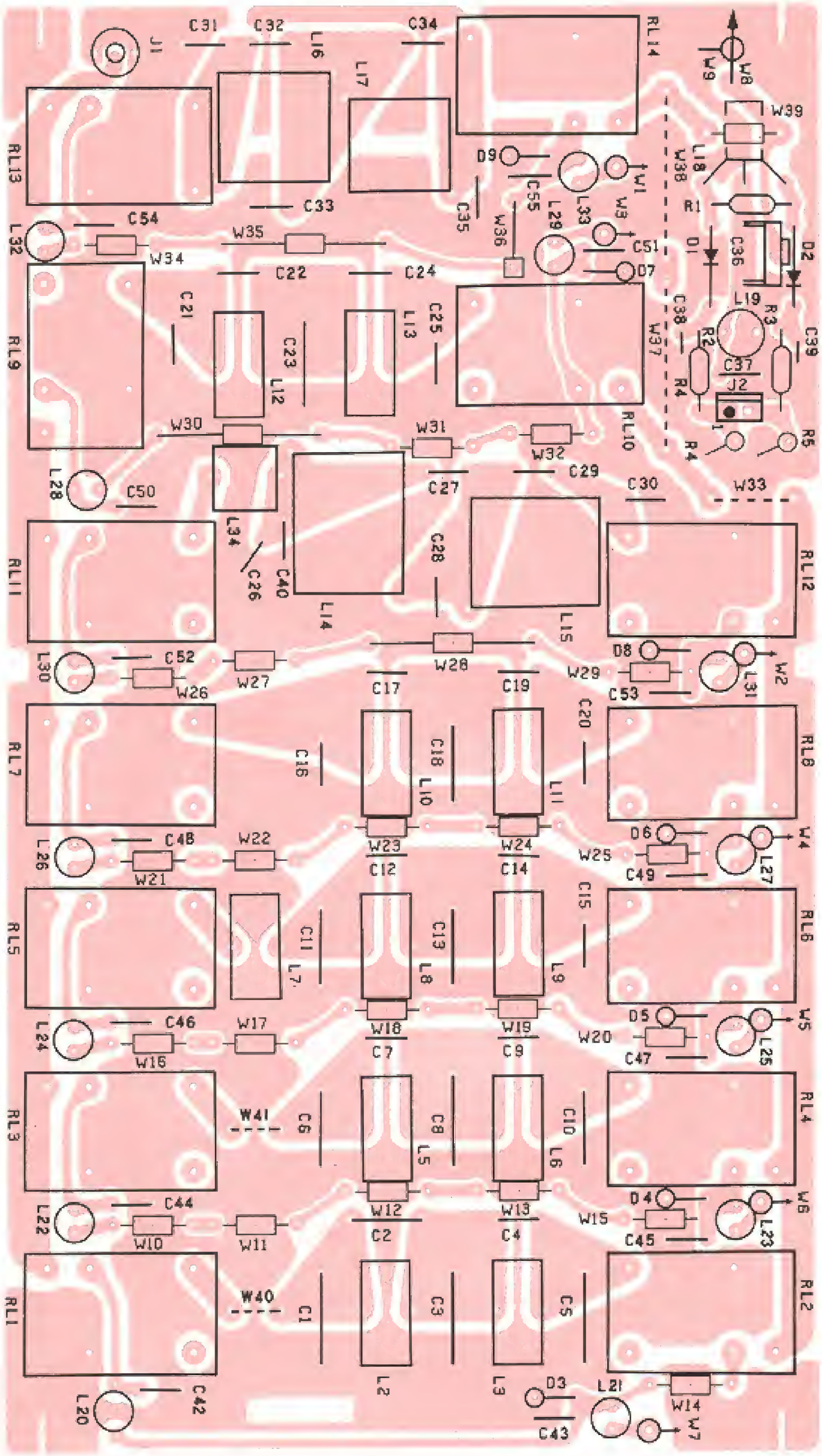




7 - 14 PA CHOKE UNIT



7 - 15 FILTER UNIT



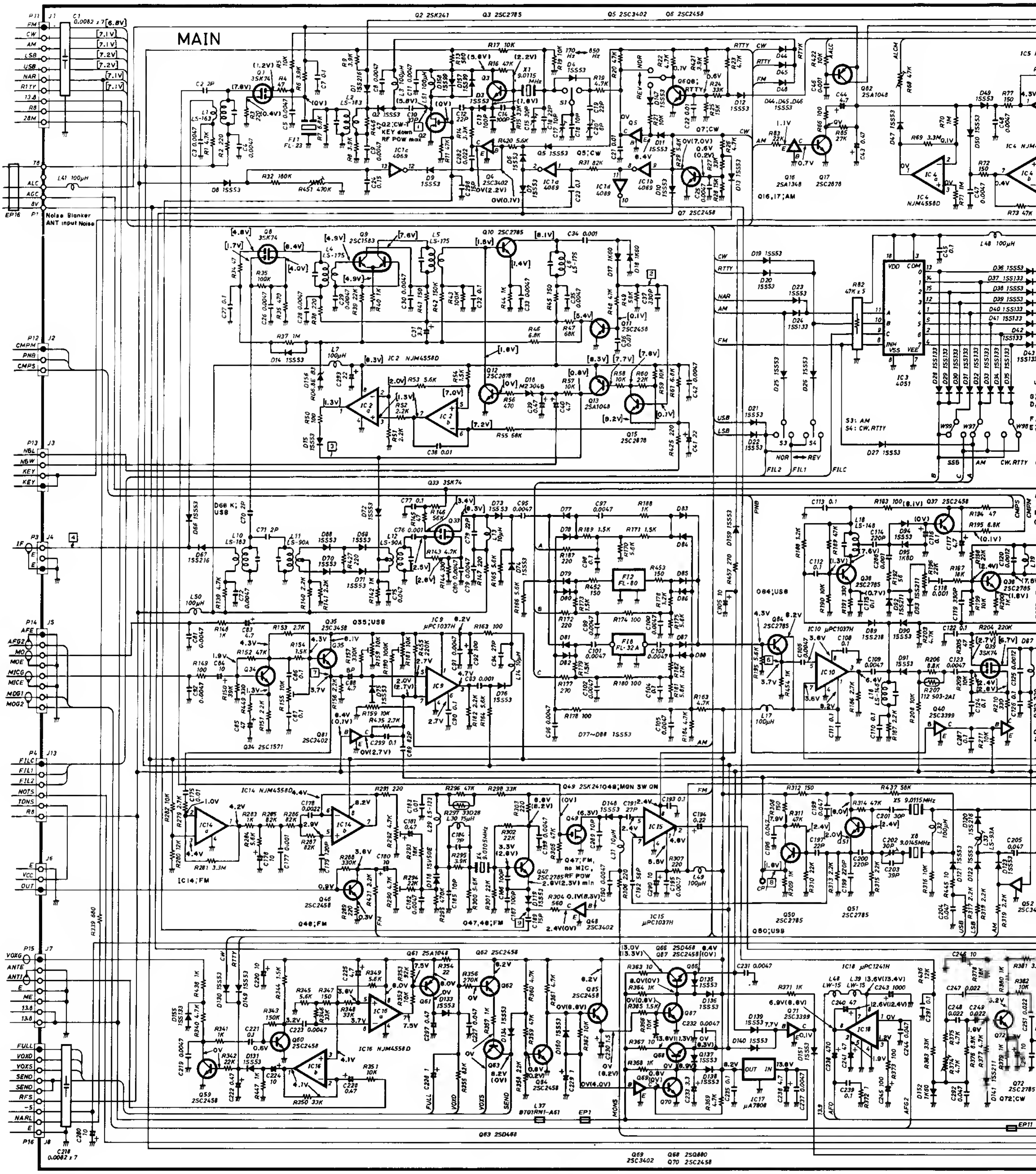
8 - 1 MAIN UNIT

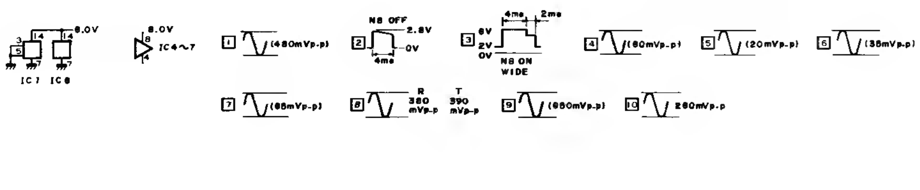
Condition of Measurement

·TX
USB 14.097MHz no modulation
(RF POWER CONT:MAX DELAY:FULL
MIC GAIN:CENTER
VOX GAIN:OFF)

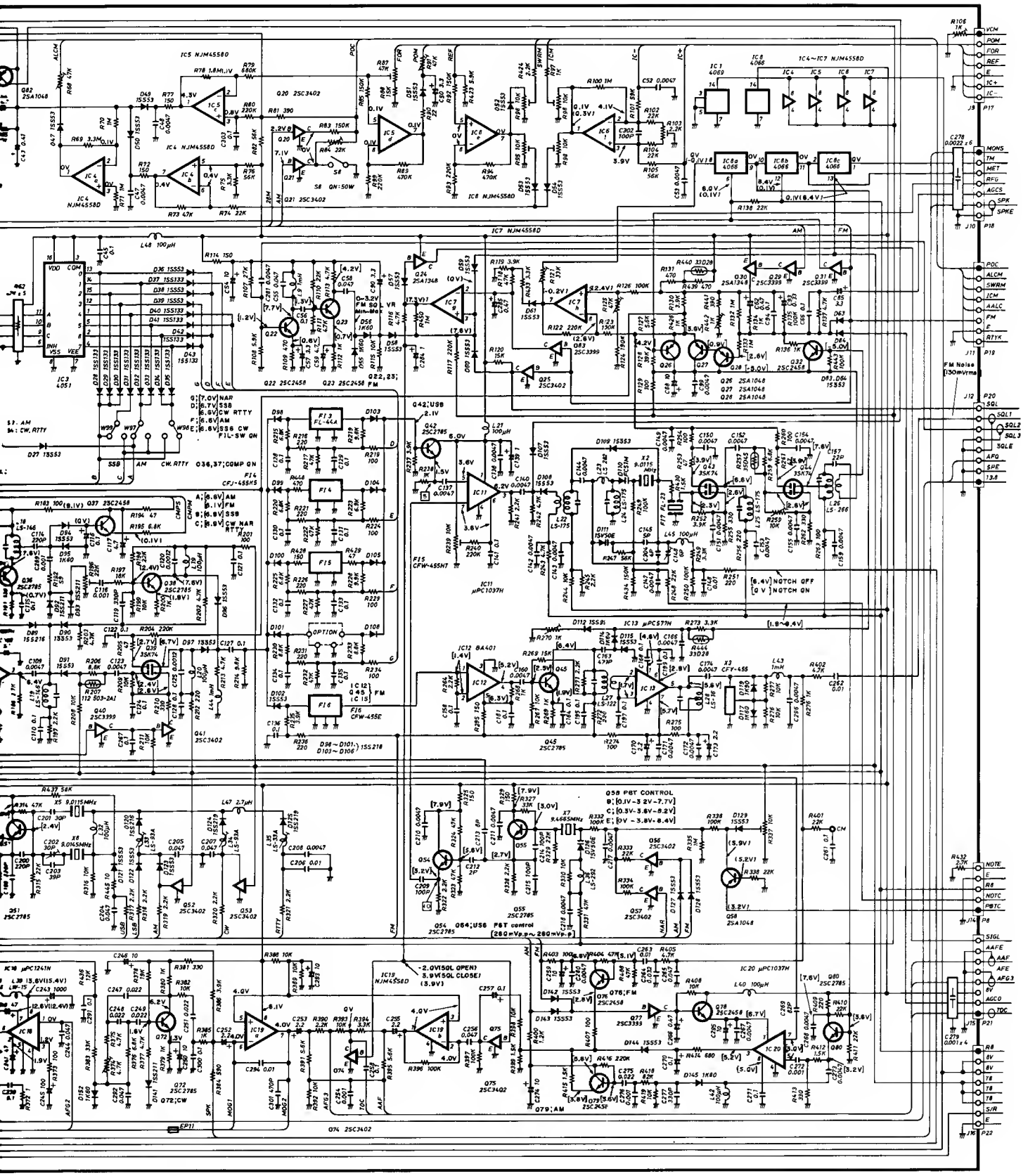
·RX
USB 14.097MHz
(RF GAIN:MAX AGC:OFF
TONE CONTROL:CENTER NB:OFF)

Note
1.Measure with Tester 50kΩ/V
2.( )=TX
[ ]=RX
A(B)=A···RX, B···TX
C = RX,TX common.

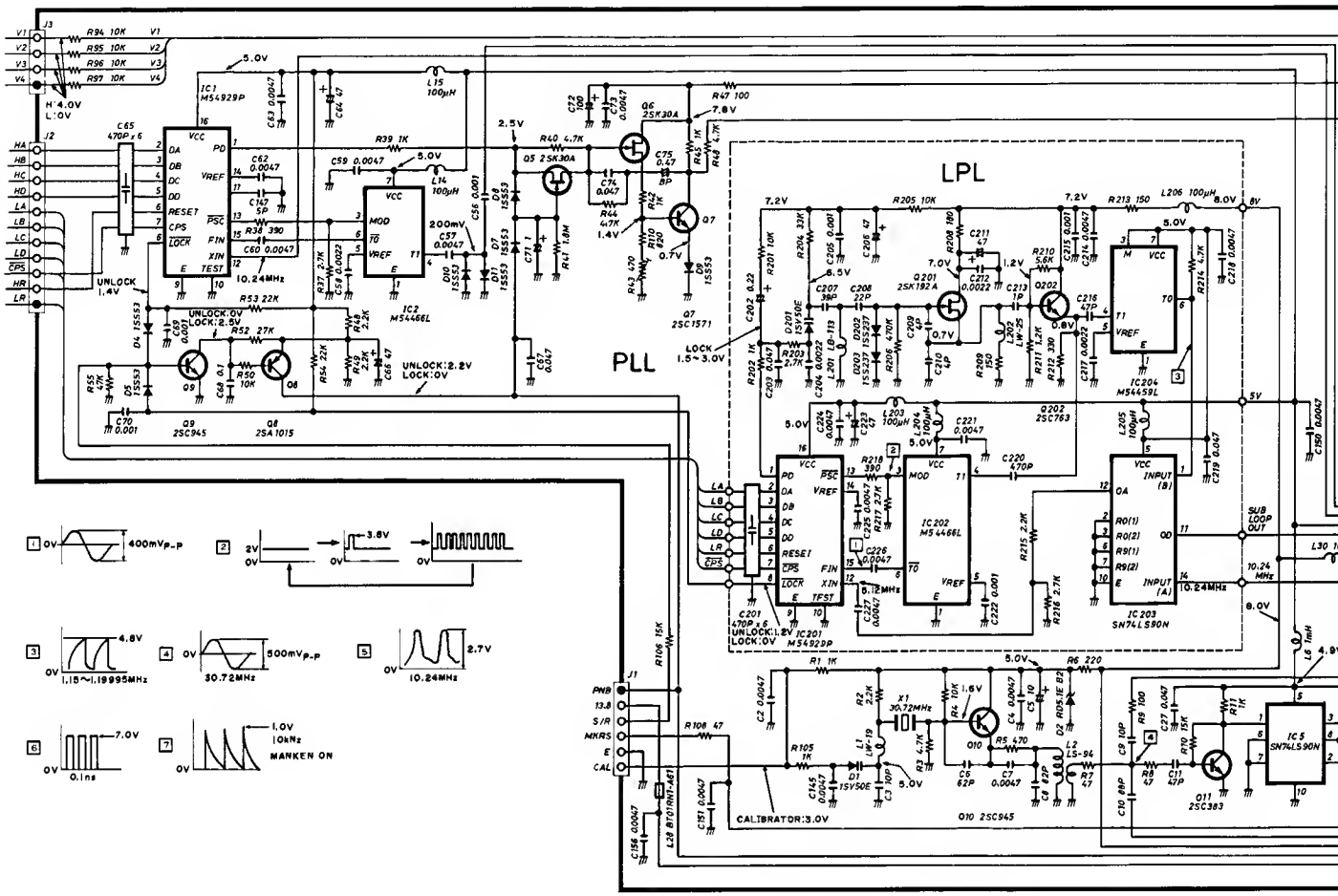


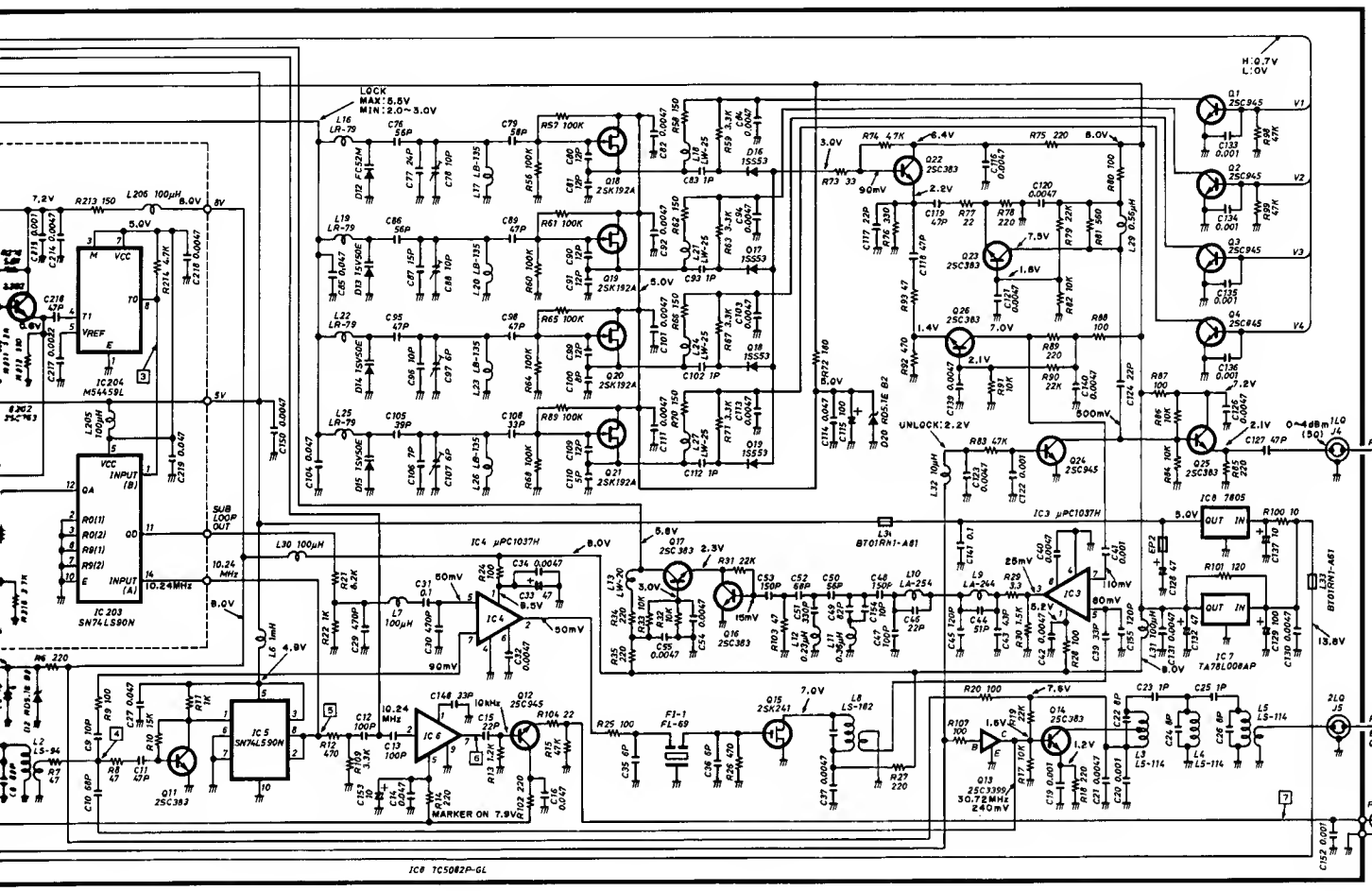


IC7	SQL open	SQL closed
Kpin	3.4V	7.3V
2	0V	0V
3	0.4V	2.4V(max)
4	5.0V	5.0V
5	2.4V	2.4V
6	2.8V	2.8V
7	0.1V	0.1V
8	8.7V	8.1V

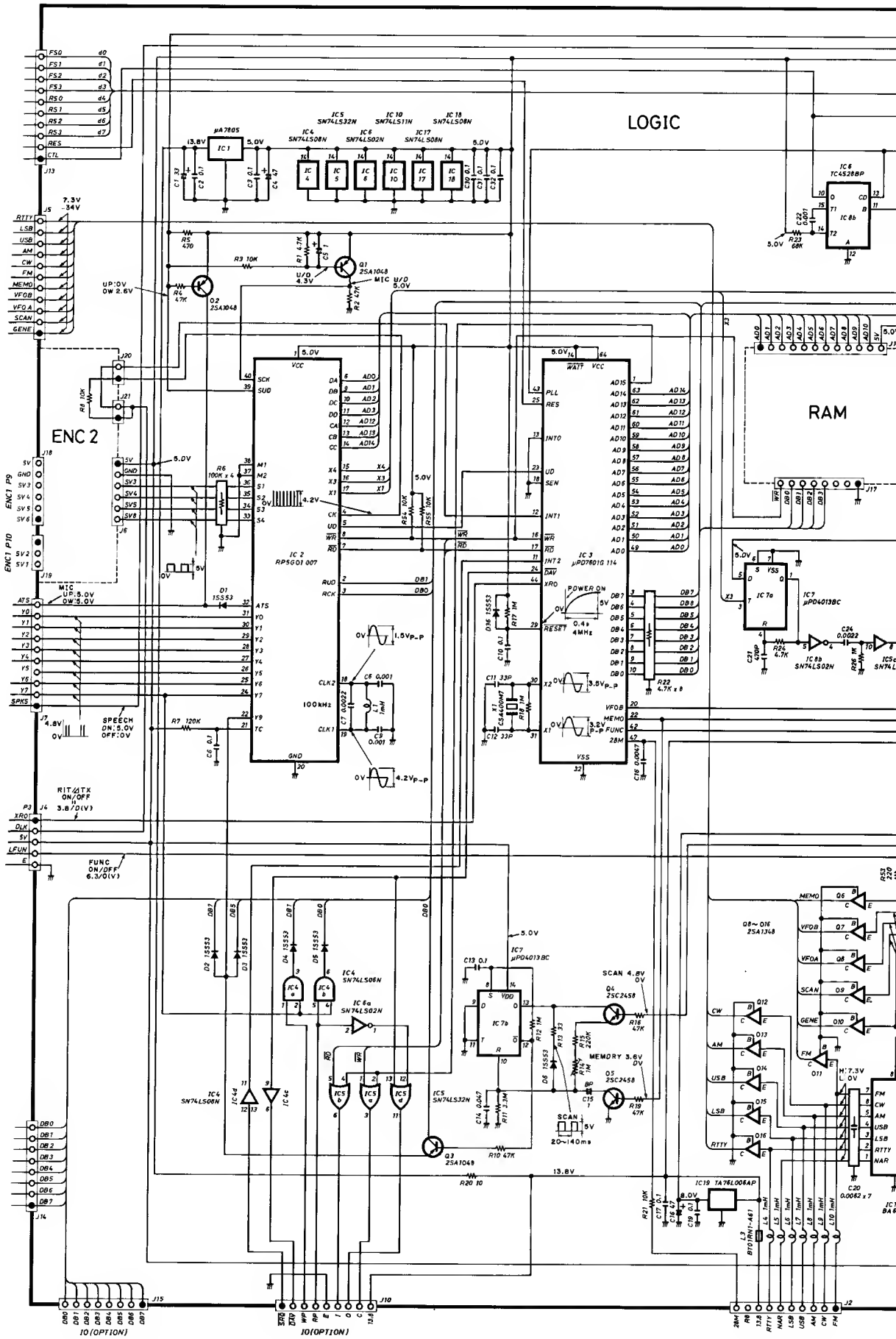


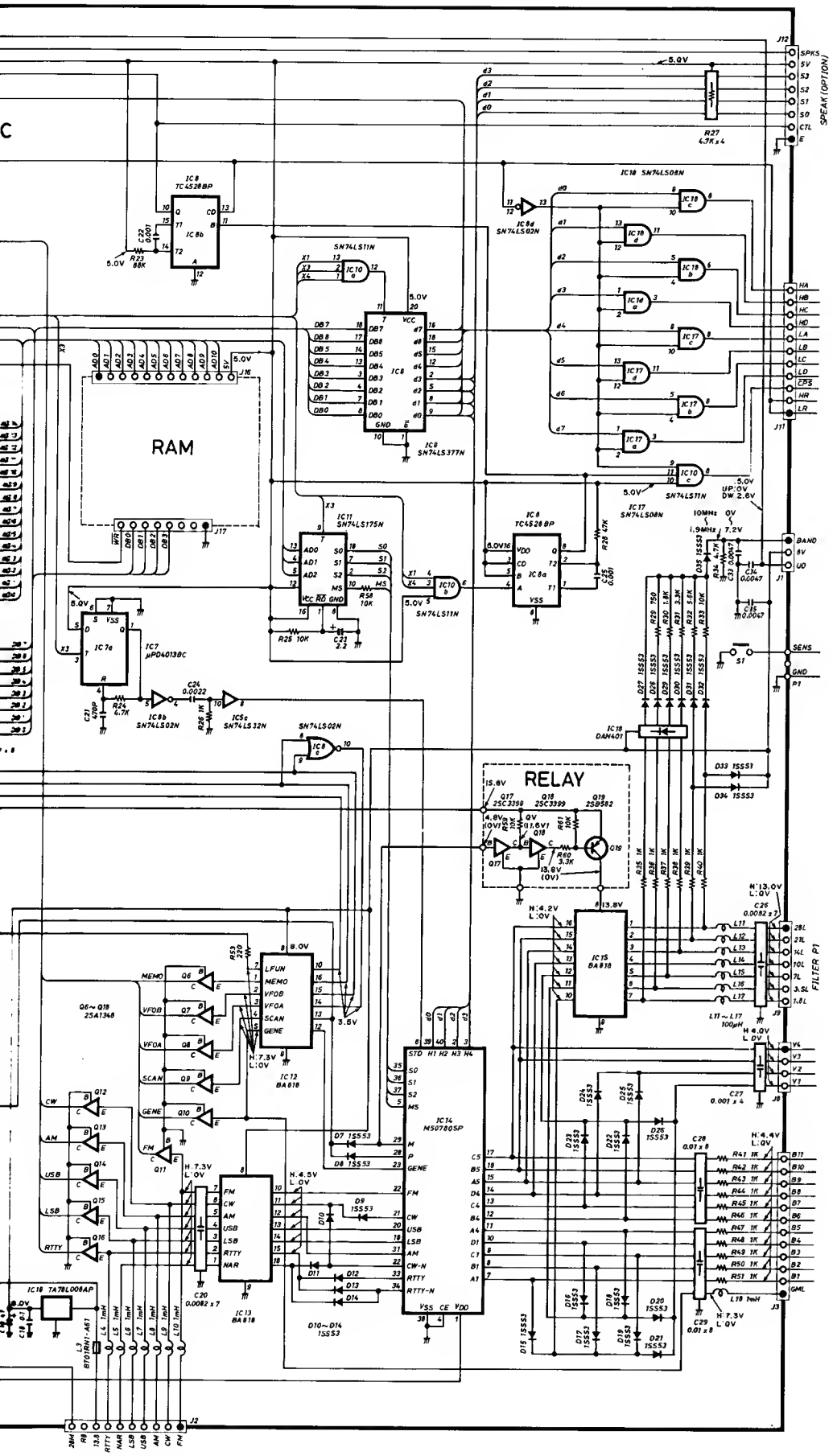
8 - 2 PLL UNIT

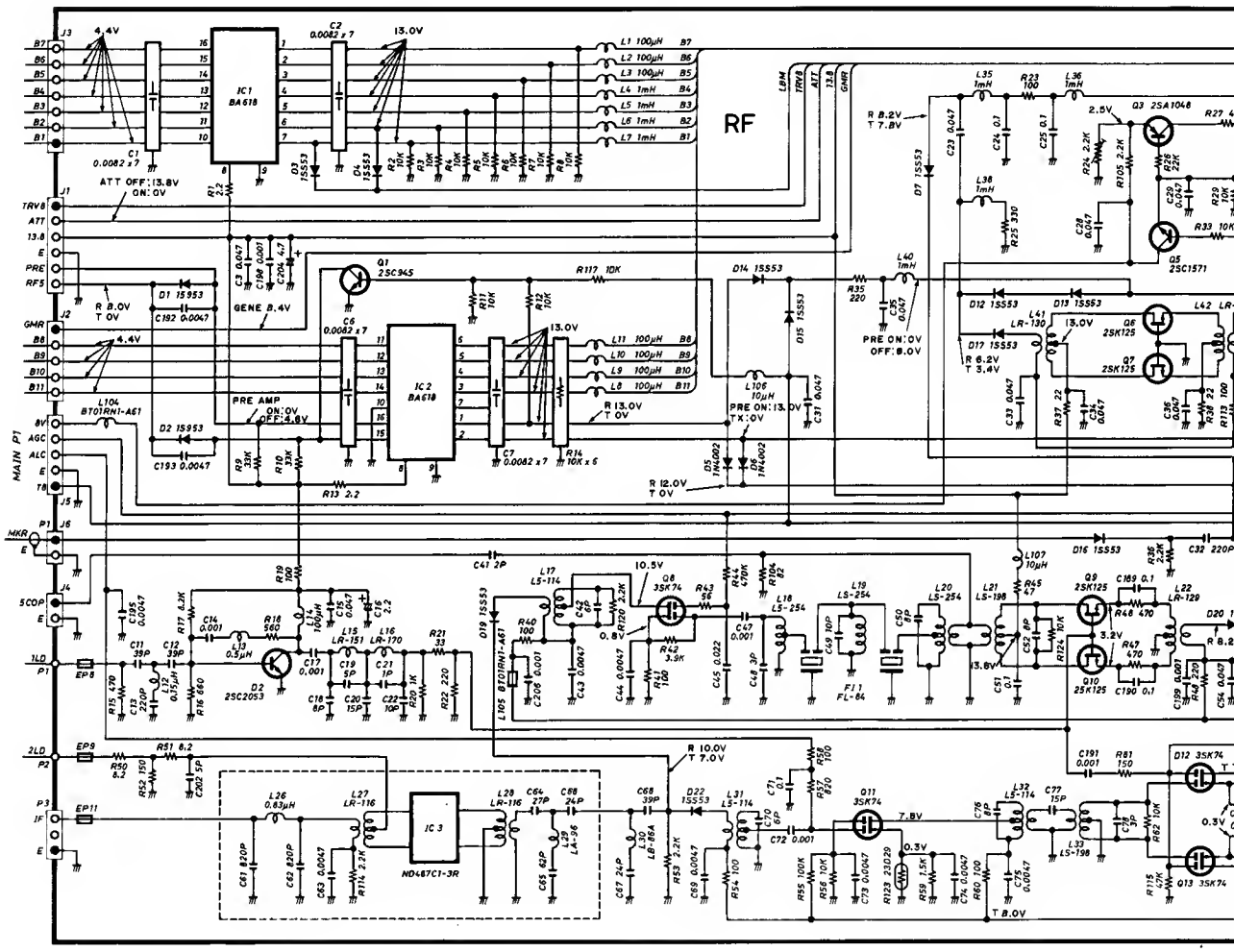

PLL
LPL
IC1 M54929P
IC2 M54466L
IC201 M54929P
IC202 M54466L
IC203 SN74LS90N
IC204 M54459L
IC5 SN74LS90N
Q5 2SK30A
Q6 2SK30A
Q7 2SC1571
Q8 2SA1015
Q9 2SC945
Q10 2SC945
Q11 2SC383
Q201 2SK192A
Q202 2SC763
10.24MHz
30.72MHz
UNLOCK 1.4V
LOCK 1.5~3.0V
CALIBRATOR:3.0V
SUB LOOP OUT
MANKEN ON

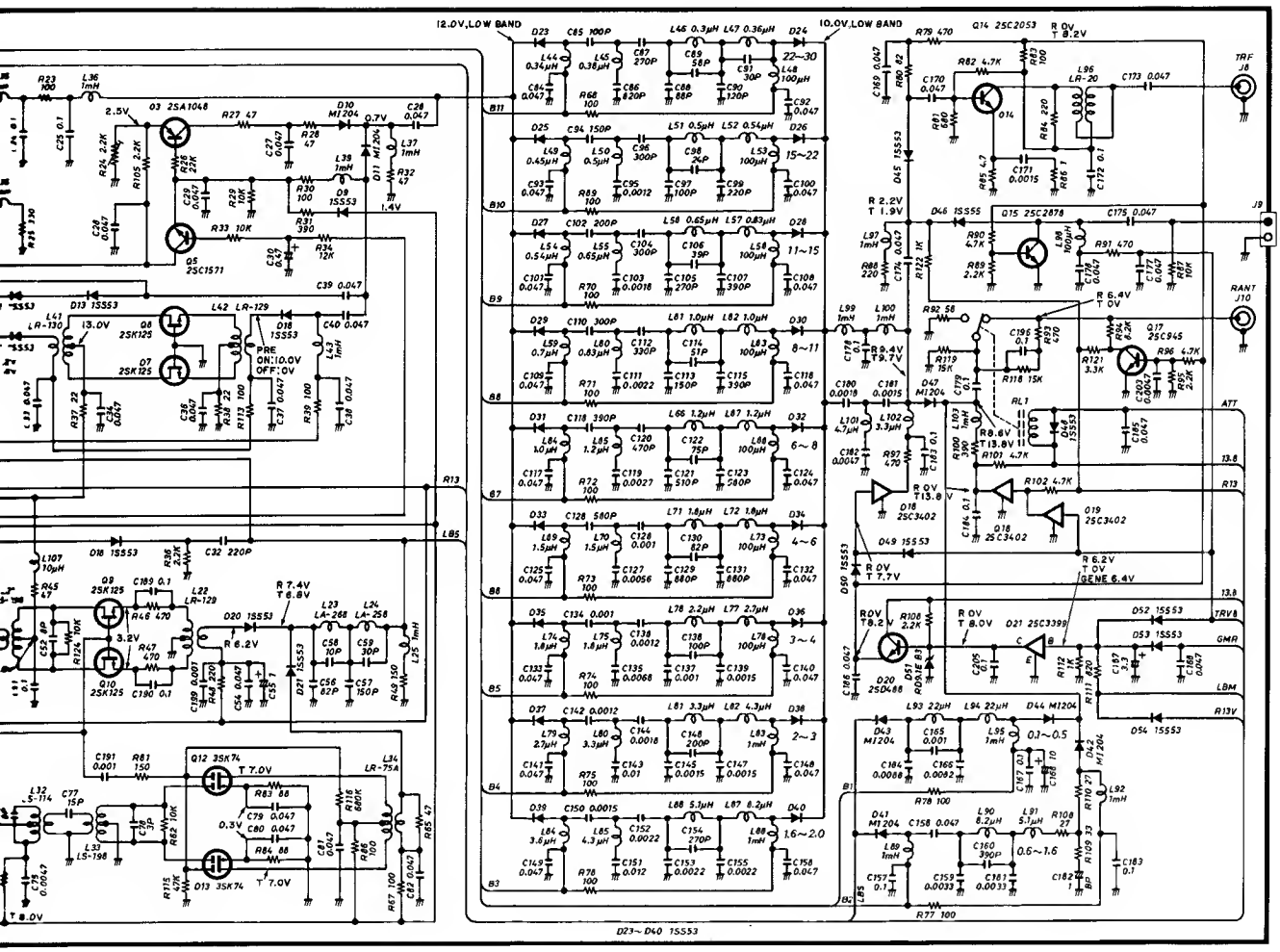

IC 203
SN74LS90N
IC204
MS4459L
IC 5
SN74LS90N
IC4 μPC1037H
IC3 μPC1037H
IC 6
IC 7
7A78L008AP
IC8 7805
IC8 TC5082P-GL
LOCK
MAX:5.8V
MIN:2.0~3.0V
UNLOCK:2.2V
H:0.7V
L:0V
MARKER ON 7.9V
10.24MHz
81.44MHz
0~4dBm
(50)
SUB
LOOP
OUT

8 - 3 LOGIC UNIT

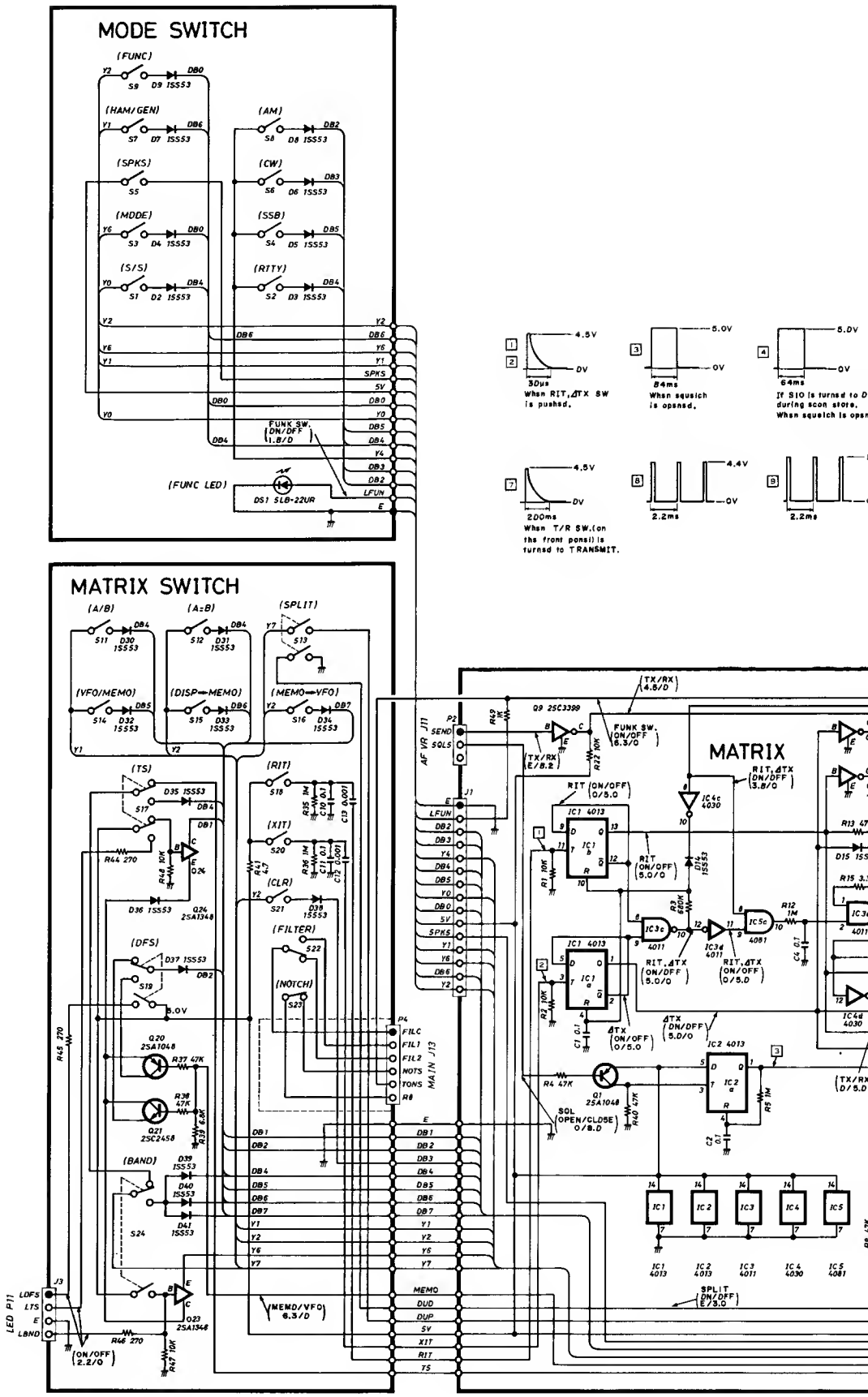


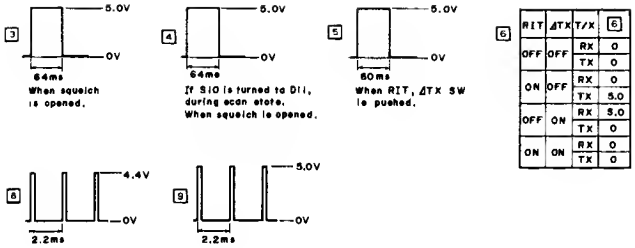

RAM
RELAY
SPEAK (OPTION)
FILTER P1
SN74LS11N
SN74LS377N
SN74LS08N
SN74LS02N
SN74LS32N
SN74LS175N
TC4528BP
TC4S28BP
μPD4013BC
BA818
M50780SP
TA78L008AP
DAN401
25C3358
25C3399
2SB582
25A1348
1SS53
MEMO
VFOB
VFOA
SCAN
GENE
CW
AM
USB
LSB
RTTY
NAR
RTTY-N
BAND
SENS
GND
P1
J1
J2
J3
J8
J9
J11
J12
J15
J16
J17


RF
MAIN P1
IC1 BA618
IC2 BA618
IC 3
ND487C1-3R
ATT OFF:13.8V ON:0V
PRE AMP ON:0V OFF:4.8V
PRE ON:0V OFF:8.0V
PRE ON:13.0V TX:0V
GENE 8.4V
Q1 2SC945
D2 2SC2053
Q3 2SA1048
Q5 2SC1571
Q6 2SK125
Q7 2SK125
Q8 3SK74
Q9 2SK125
Q10 2SK125
Q11 3SK74
Q13 3SK74
FI1 FL-84
D1 1S953
D2 1S953
D3 1S553
D7 1S553
D12 1S553
D13 1S553
D14 1S553
D15 1S553
D16 1S553
D17 1S553
D19 1S553
D5 1N4002
D6 1N4002
L104 BT01RH1-A61
L105 BT01RH1-A61
L1 100μH B7
L2 100μH B6
L3 100μH B5
L4 1mH B4
L5 1mH B3
L6 1mH B2
L7 1mH B1
L8 100μH B11
L9 100μH B10
L10 100μH B9
L11 100μH B8
L106 10μH
L107 10μH
L15 LR-151
L16 LR-170
L17 LS-114
L18 LS-254
L19 LS-254
L20 LS-254
L21 LS-198
L22 LR-129
L26 0.63μH
L27 LR-116
L28 LR-116
L29 LA-96
L30 LB-86A
L31 LS-114
L32 LS-114
L33 LS-198
L35 1mH
L36 1mH
L38 1mH
L40 1mH
L41 LR-130
L42 LR-
R 8.0V T 0V
R 8.2V T 7.8V
R 13.0V T 0V
R 12.0V T 0V
R 10.0V T 7.0V
R 6.2V T 3.4V
R 8.0V T 8.0V
GENE 8.4V
10.5V
0.8V
3.2V
7.8V
0.3V
13.6V
2.5V
4.4V
13.0V
TRVB
ATT
13.8
E
PRE
RF5
GMR
B8
B9
B10
B11
8V
AGC
ALC
E
TB
MKR
E
SCOP
E
1LO
P1
2LO
P2
P3
IF
E
EP8
EP9
EP11

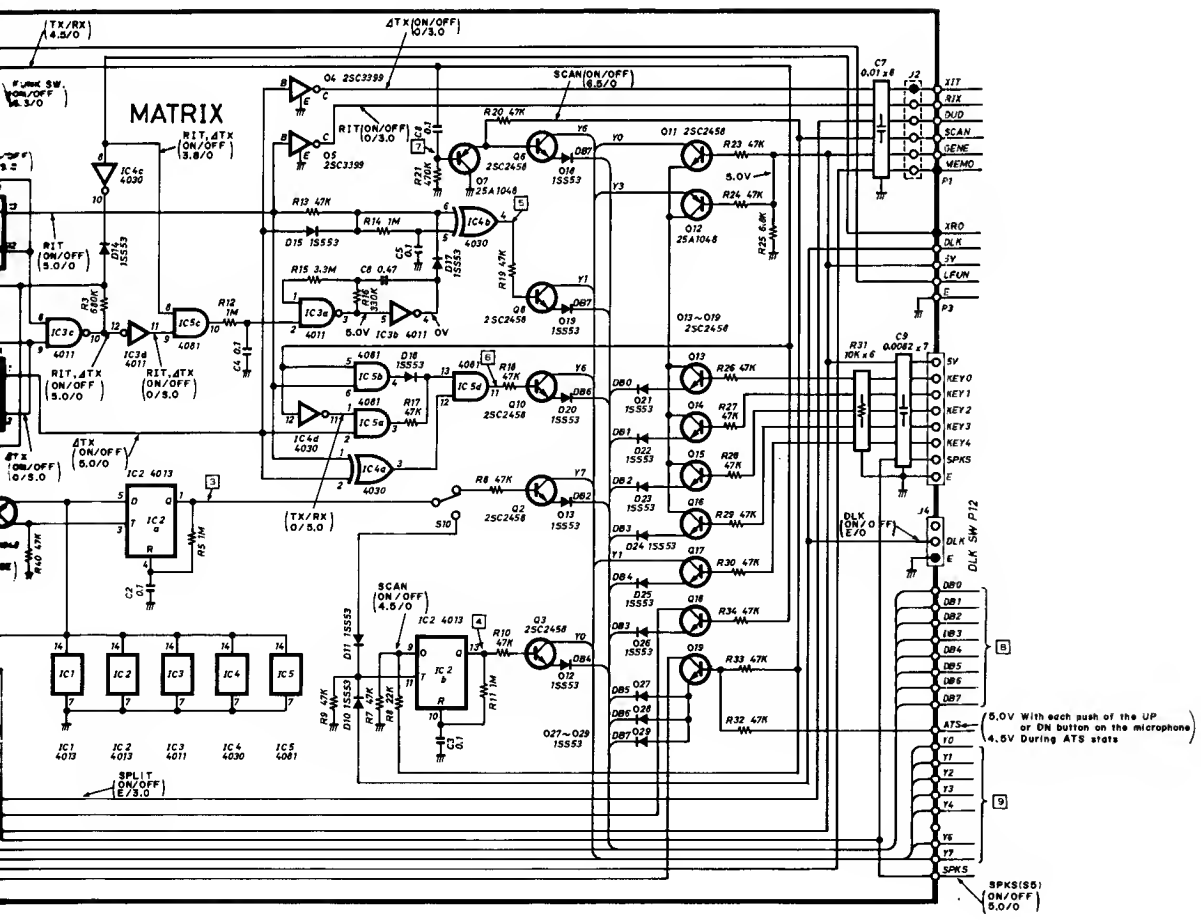

12.0V,LOW BAND
10.0V,LOW BAND
Q3 2SA1048
Q5 2SC1571
Q6 2SK125
Q7 2SK125
Q9 2SK125
Q10 2SK125
Q12 3SK74
D13 3SK74
Q14 2SC2053
Q15 2SC2878
Q17 2SC945
D18 2SC3402
Q19 2SC3402
D20 2SD88
Q21 2SC3398
D23~D40 1SS53
TRF J8
TRV J9
RANT J10
ATT
13.8
R13
TRV8
GMA
LBM
R13V
GENE 6.4V

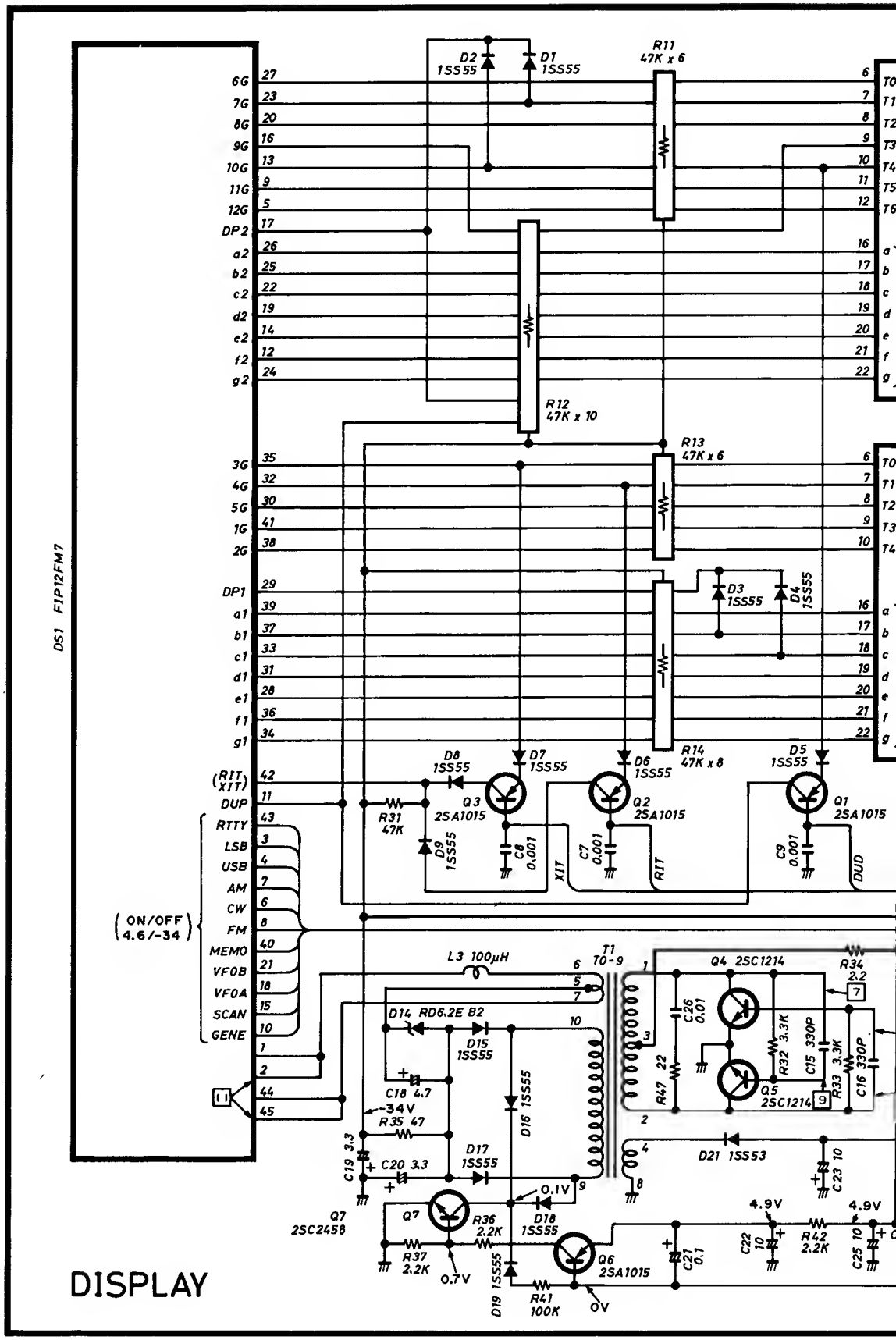
8 - 5 MATRIX UNIT

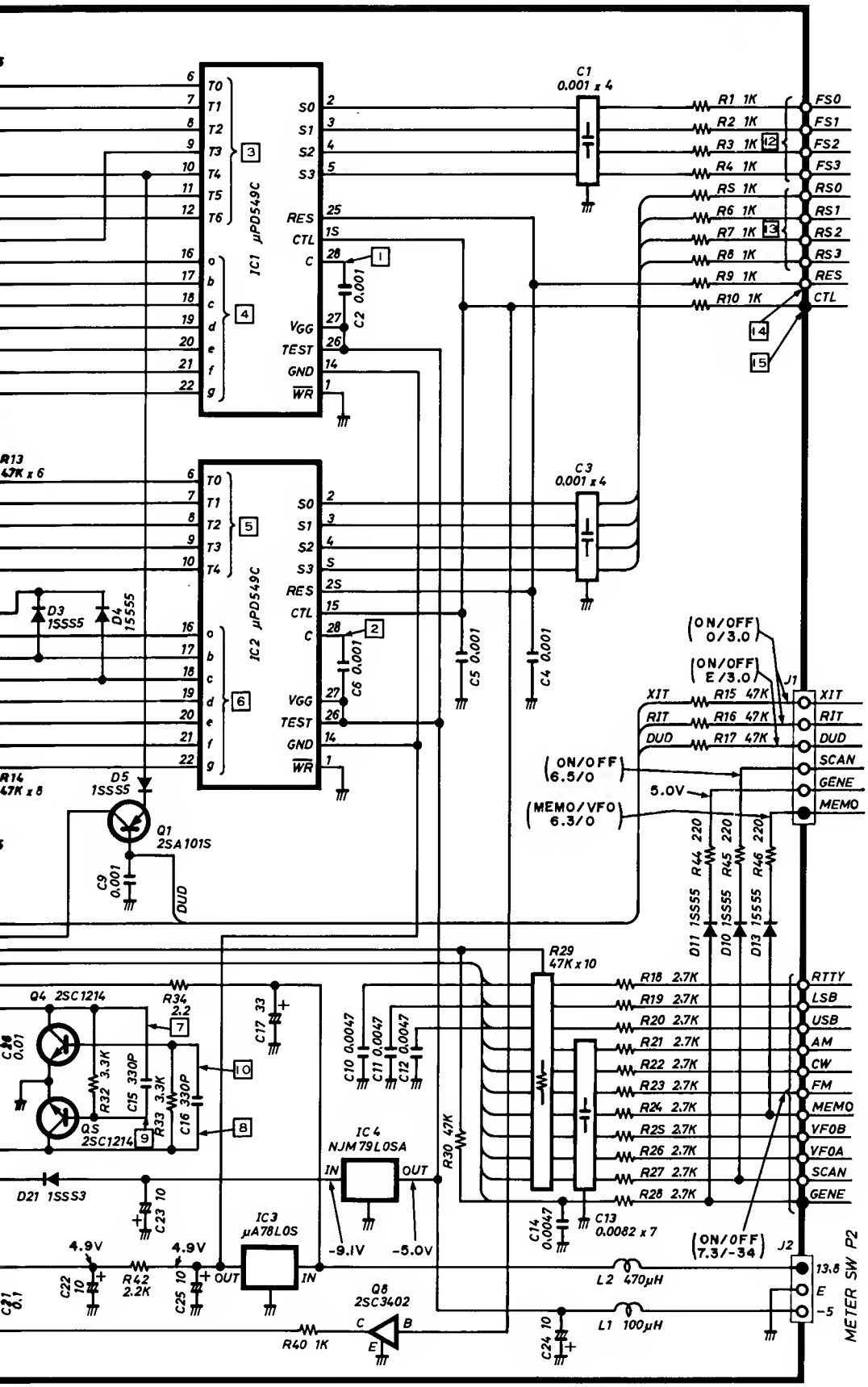


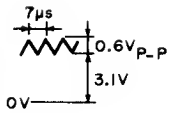


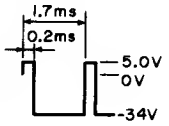
RIT	ΔTX	T/X	6
OFF	OFF	RX	0
		TX	0
ON	OFF	RX	0
		TX	5.0
OFF	ON	RX	5.0
		TX	0
ON	ON	RX	0
		TX	0

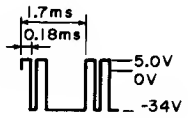


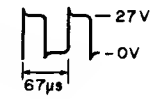

DISPLAY
DS1 F1P12FM7
D2 1SS55
D1 1SS55
R11 47K x 6
R12 47K x 10
R13 47K x 6
R14 47K x 8
D3 1SS55
D4 1SS55
D5 1SS55
D6 1SS55
D7 1SS55
D8 1SS55
D9 1SS55
Q1 2SA1015
Q2 2SA1015
Q3 2SA1015
R31 47K
C6 0.001
C7 0.001
C9 0.001
XIT
RIT
DUD
6G
7G
8G
9G
10G
11G
12G
DP2
a2
b2
c2
d2
e2
f2
g2
3G
4G
5G
1G
2G
DP1
a1
b1
c1
d1
e1
f1
g1
(RIT XIT)
DUP
RTTY
LSB
USB
AM
CW
FM
MEMO
VFOB
VFOA
SCAN
GENE
(ON/OFF 4.6/-34)
L3 100µH
T1 T0-9
Q4 2SC1214
Q5 2SC1214
R34 2.2
R32 3.3K
R33 3.3K
R47 22
C26 0.01
C15 330P
C16 330P
D14 RD6.2E B2
D15 1SS55
D16 1SS55
D17 1SS55
D18 1SS55
D19 1SS55
D21 1SS53
C18 4.7
C19 3.3
C20 3.3
C23 10
-34V
R35 47
0.1V
Q7 2SC2458
R36 2.2K
R37 2.2K
0.7V
Q6 2SA1015
R41 100K
0V
C21 0.1
C22 10
C25 10
R42 2.2K
4.9V
4.9V

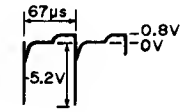


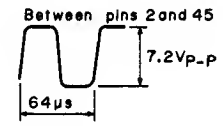
1 2


3 5


4 6


7 8


9 10


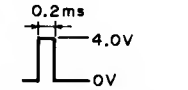
11


12


When tuning control is rotating.

13

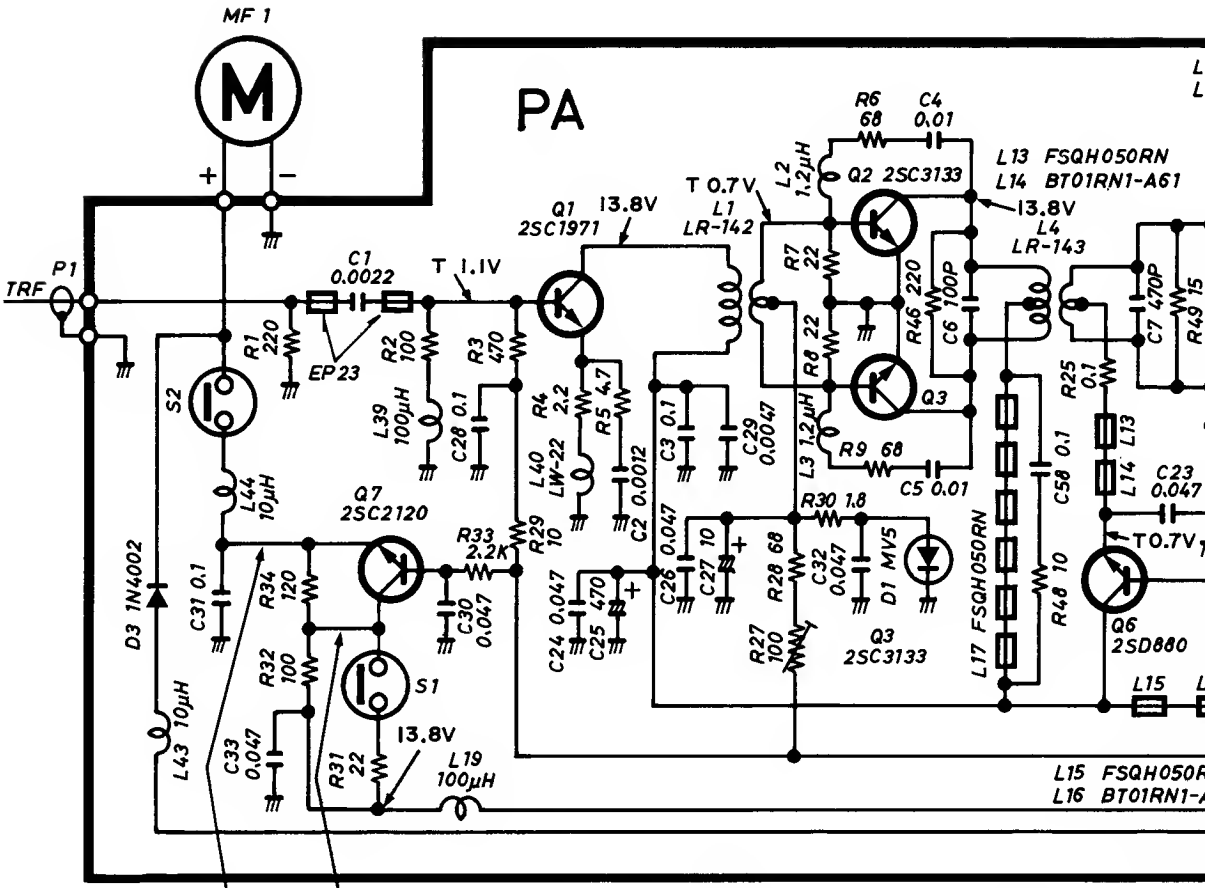

When tuning control is rotating.

14


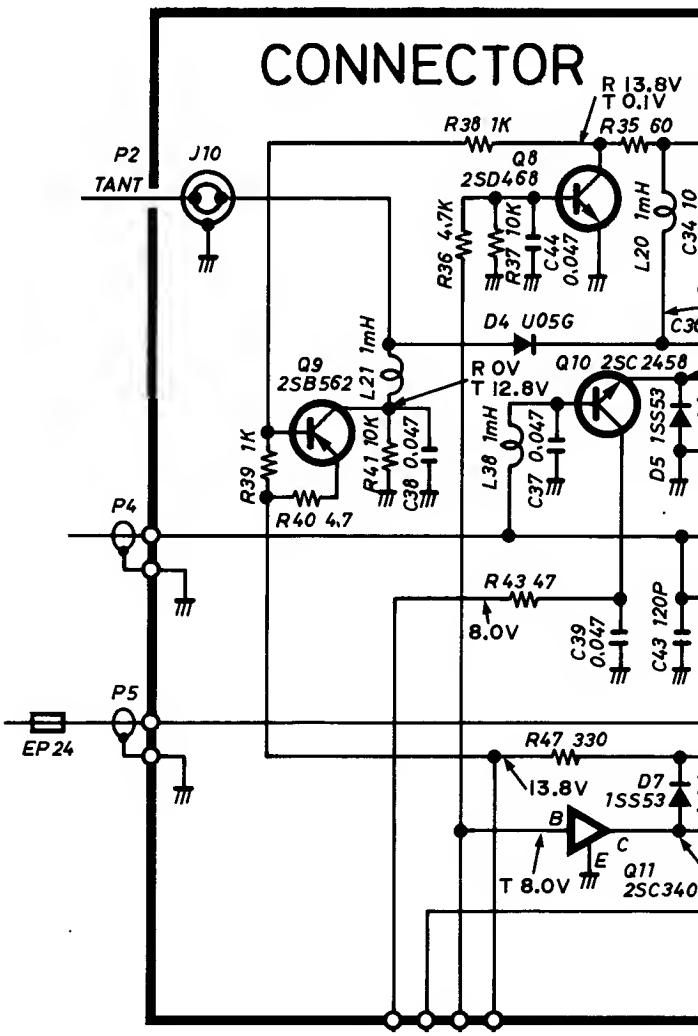
When power sw. is pushed in.

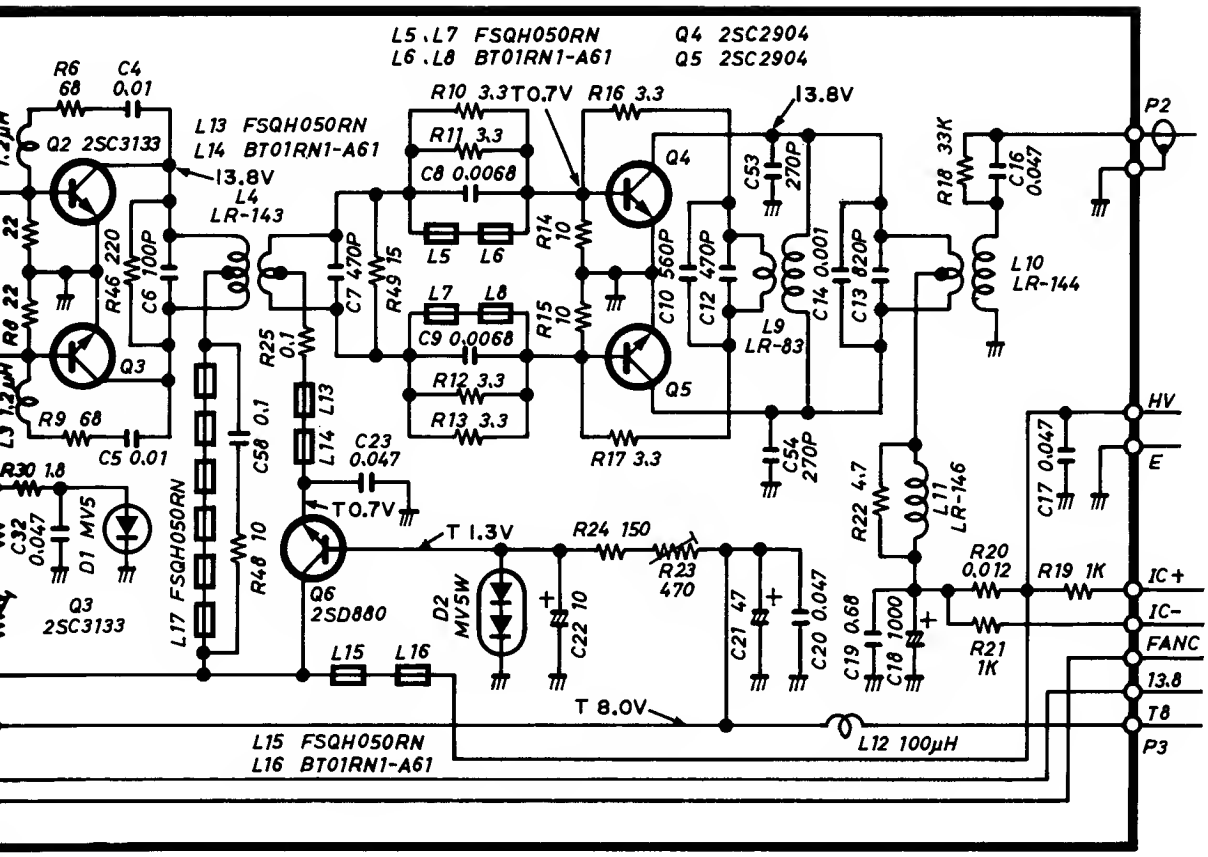
15

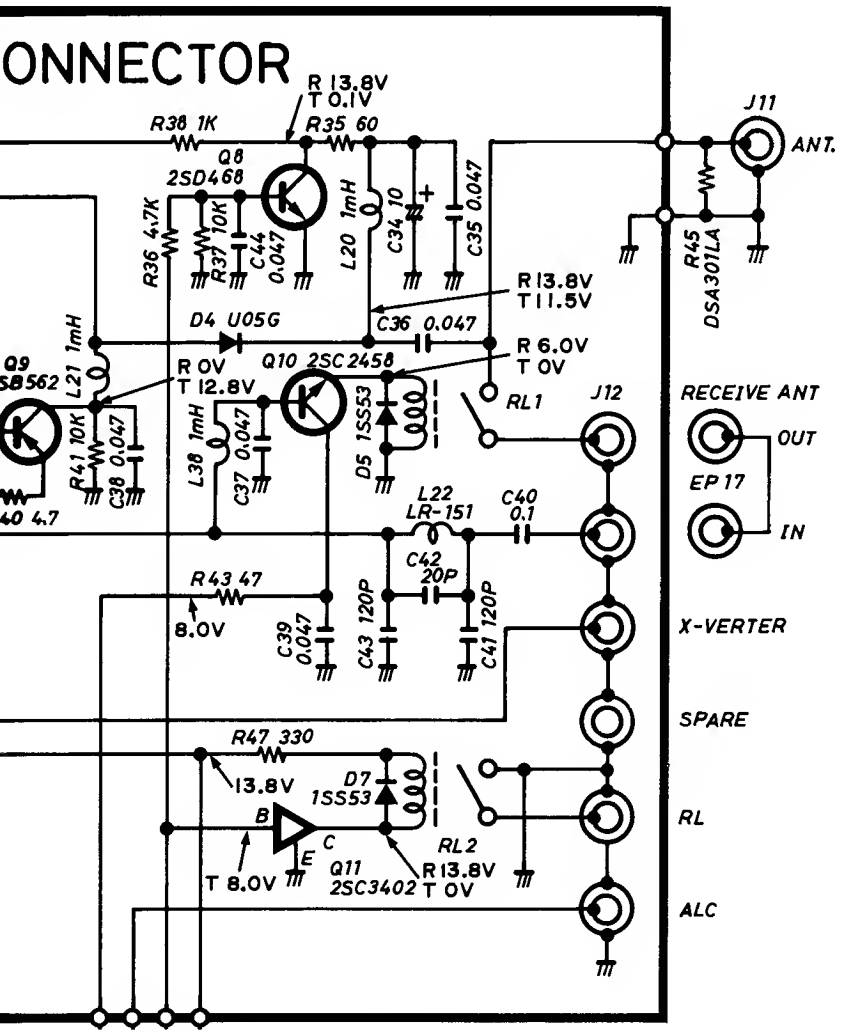

When tuning control is rotating.



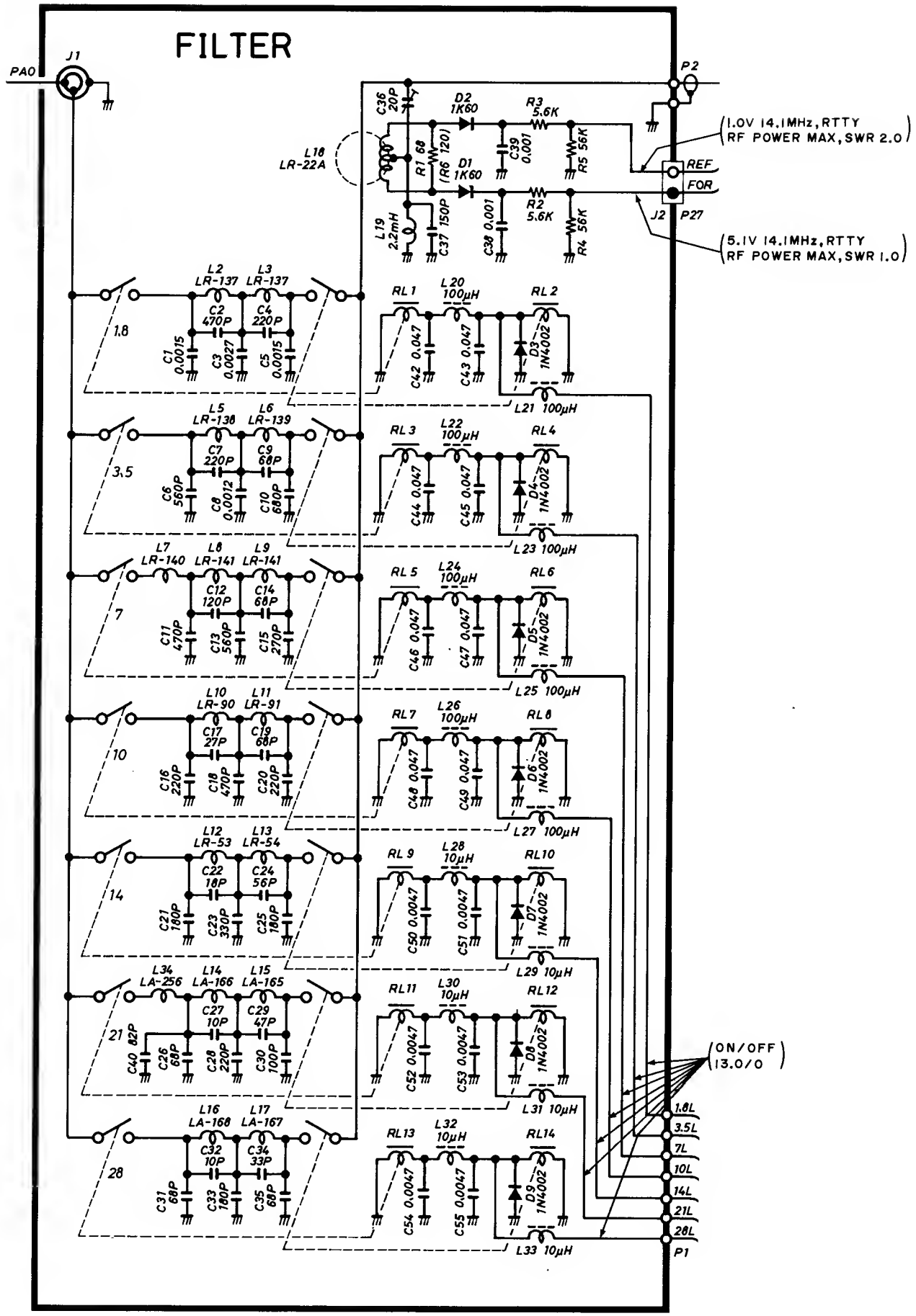
	R	T	R	T
S1 OFF S2 ON	4.0	6.0	9.5	6.5
S1 ON S2 ON	5.5	7.0	12.5	12.0



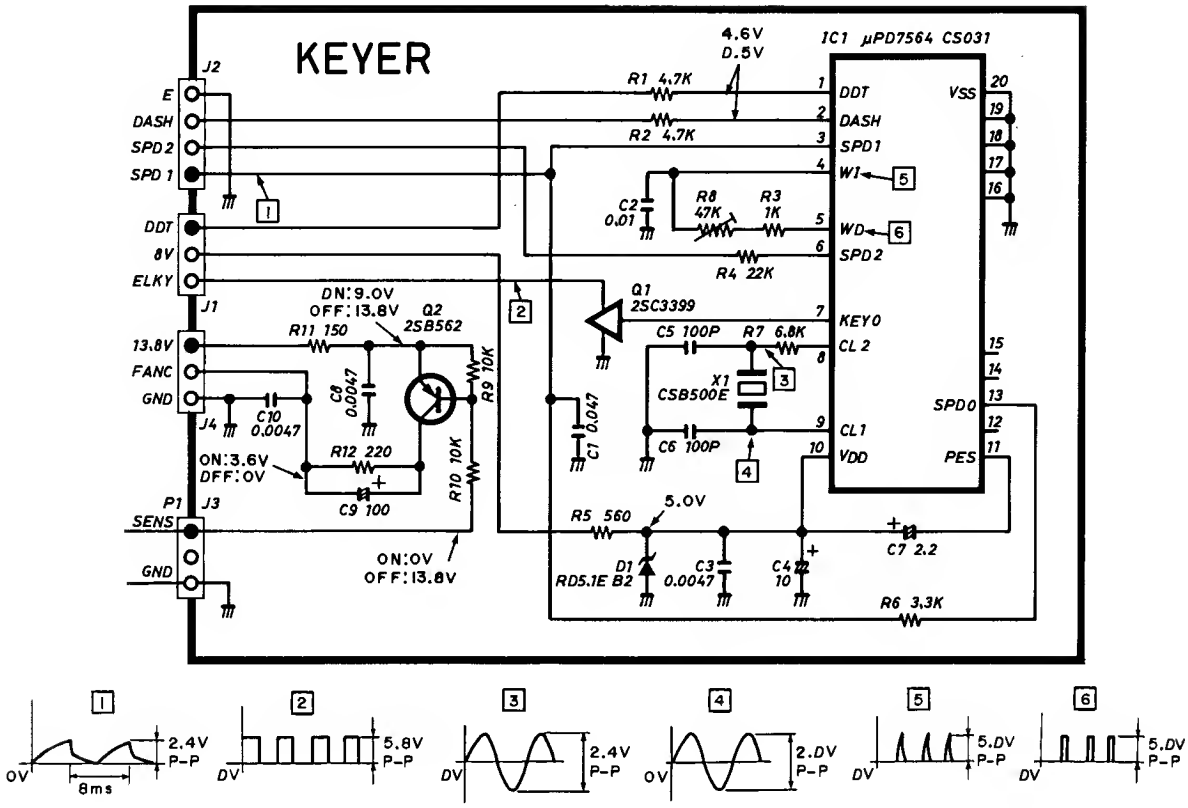

L5 .L7 FSQH050RN
L6 .L8 BT01RN1-A61
Q4 2SC2904
Q5 2SC2904
L13 FSQH050RN
L14 BT01RN1-A61
L4 LR-143
L17 FSQH050RN
L15 FSQH050RN
L16 BT01RN1-A61
L9 LR-83
L10 LR-144
L11 LR-146
L12 100µH
Q2 2SC3133
Q3 2SC3133
Q6 2SD880
D1 MV5
D2 MV5W
13.8V
T 0.7V
T 1.3V
T 8.0V
HV
E
IC+
IC-
FANC
13.8
T8
P2
P3


ONNECTOR
R 13.8V
T 0.1V
R 13.8V
T 11.5V
R 6.0V
T 0V
R 0V
T 12.8V
8.0V
T 8.0V
13.8V
J11
ANT.
J12
RECEIVE ANT
OUT
IN
EP 17
X-VERTER
SPARE
RL
ALC
RL1
RL2
Q8 2SD468
Q9 SB562
Q10 2SC2458
Q11 2SC3402
D4 U05G
D5 1SS53
D7 1SS53
DSA301LA

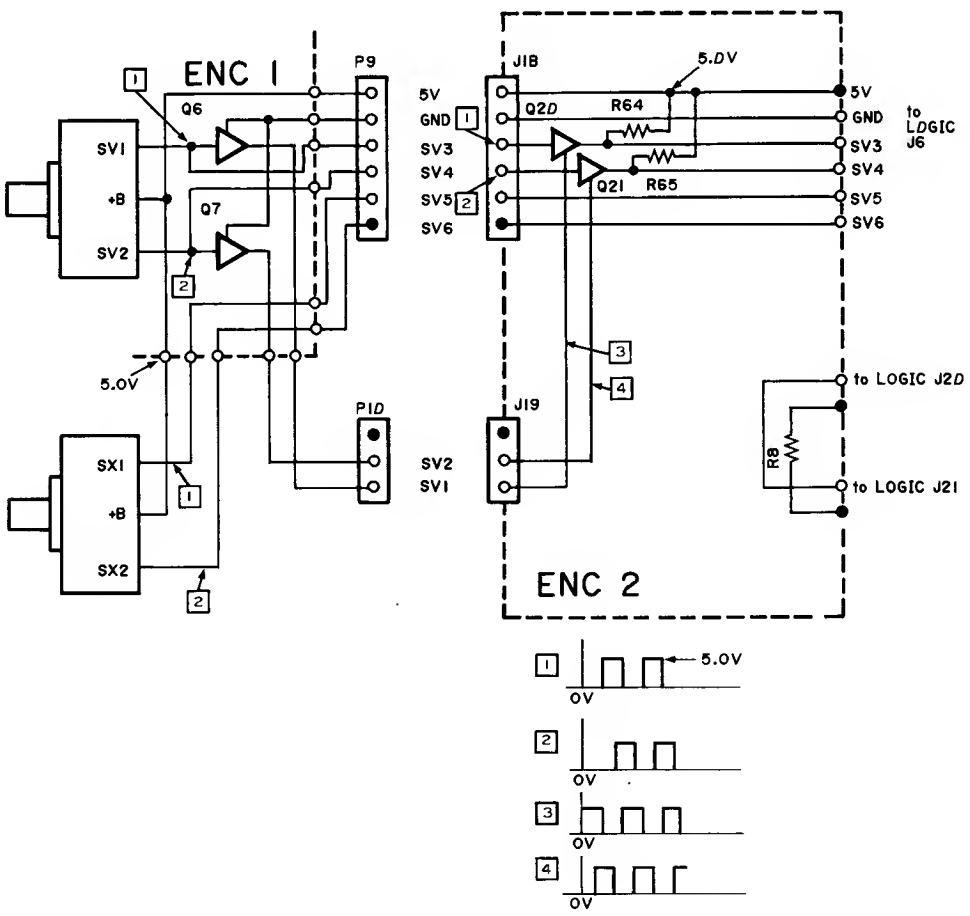
8 - 8 FILTER UNIT



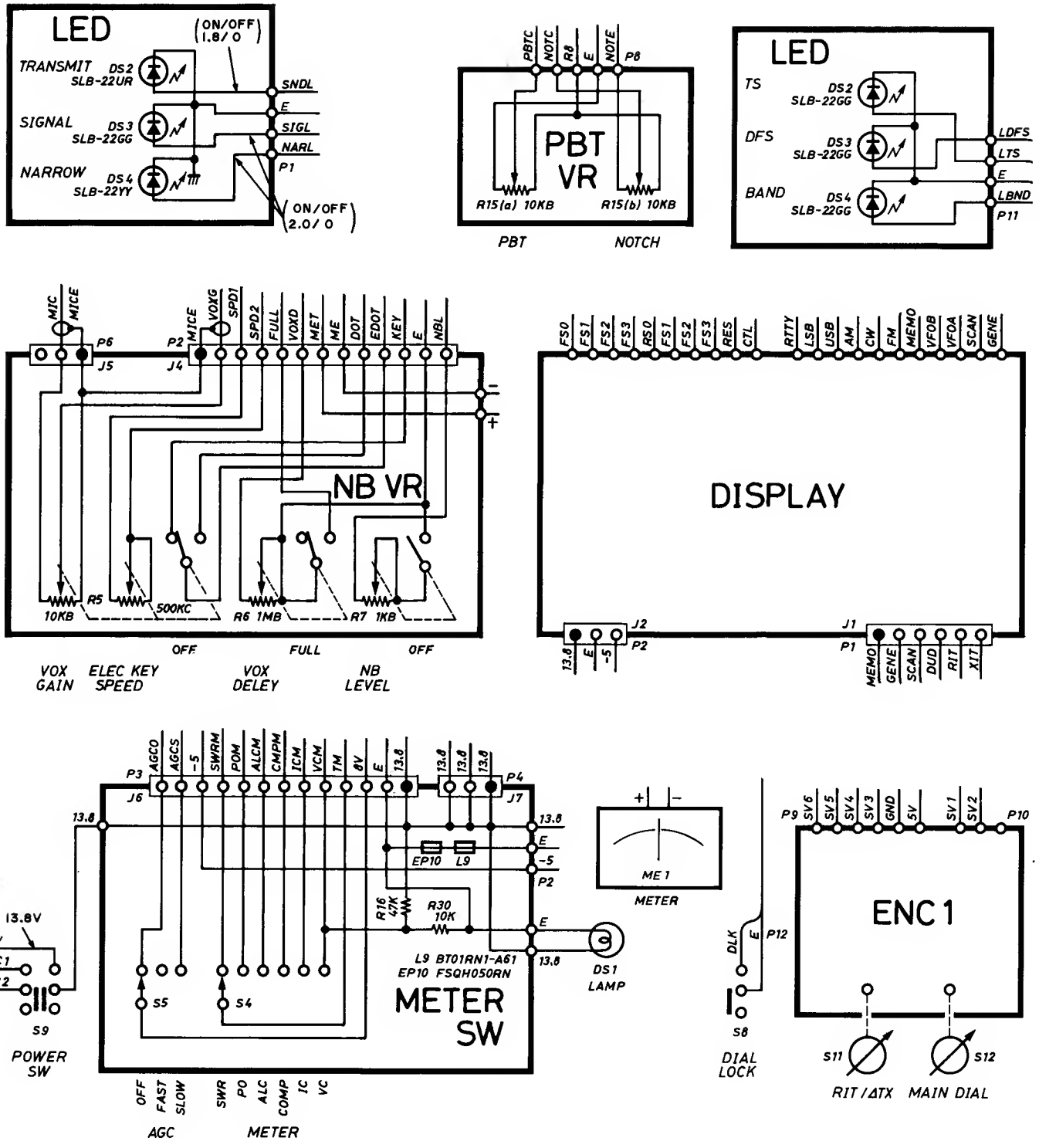
8 - 9 KEYER UNIT

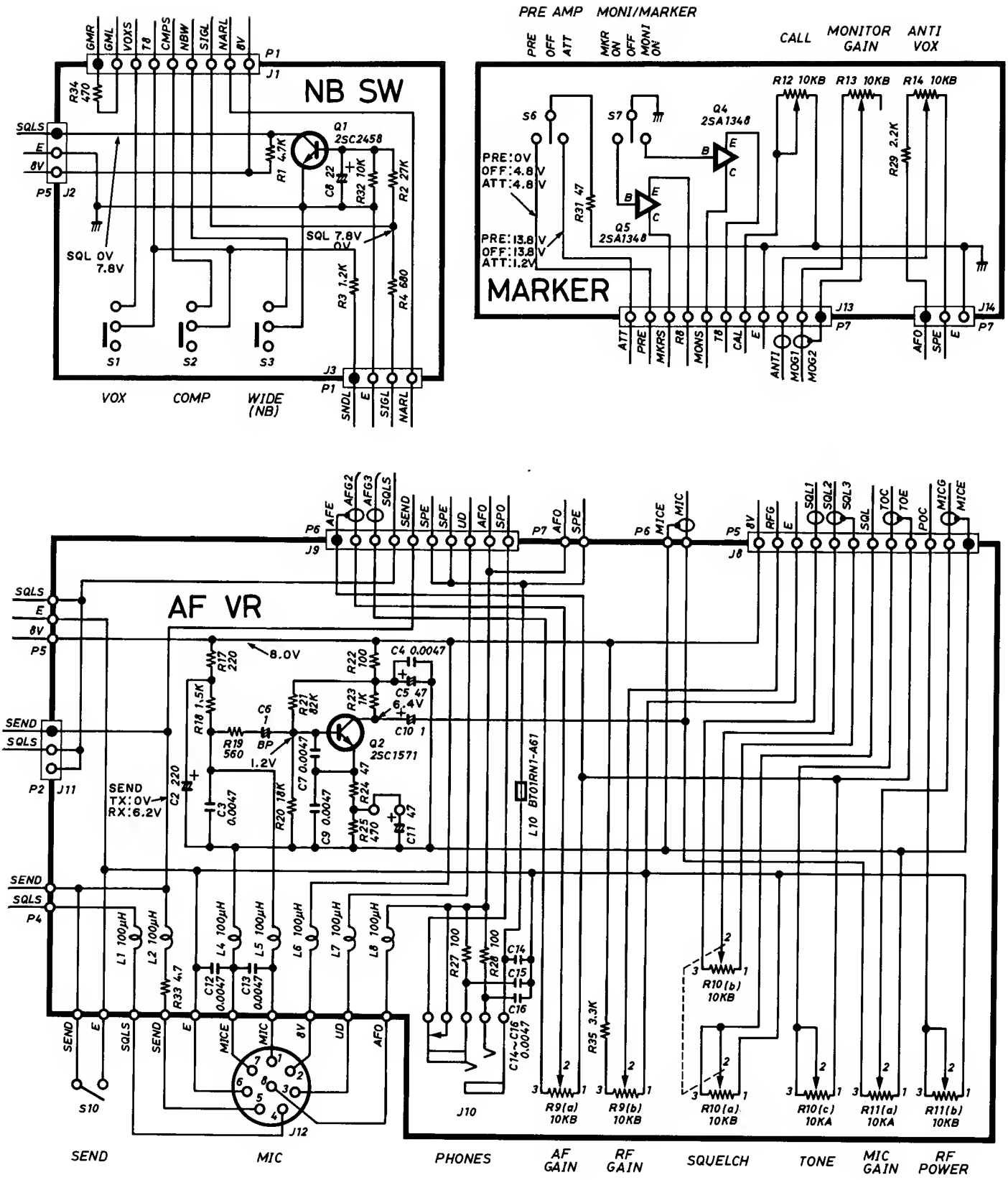


8 - 10 FRONT ENCODER UNITS



8 - 11 FRONT UNIT WIRING DIAGRAM



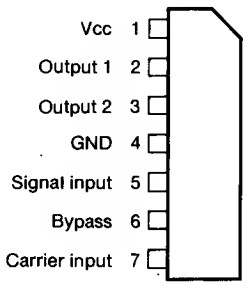

NB SW
MARKER
AF VR
PRE AMP
MONI/MARKER
CALL
MONITOR GAIN
ANTI VOX
VOX
COMP
WIDE (NB)
SEND
MIC
PHONES
AF GAIN
RF GAIN
SQUELCH
TONE
MIC GAIN
RF POWER

SECTION 9 IC SPECIFICATIONS

9 - 1 LINEAR ICs

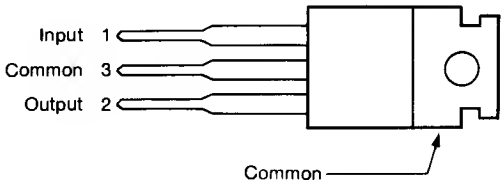
μPC1037H (DOUBLE BALANCED MODULATOR)

PIN CONNECTIONS



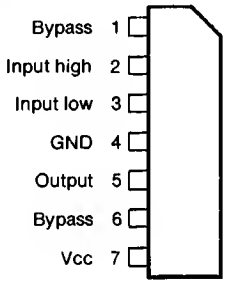
μA7805 (5V POSITIVE VOLTAGE REGULATOR)

PIN CONNECTIONS



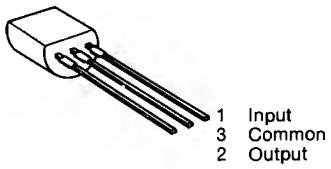
μPC577H (FM-IF AMPLIFIER)

PIN CONNECTIONS



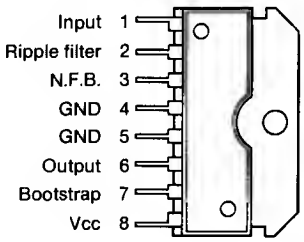
μA78L05 (POSITIVE VOLTAGE REGULATOR)

PIN CONNECTIONS



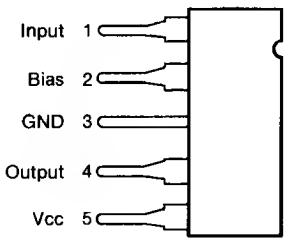
μPC1241H (AUDIO POWER AMPLIFIER)

PIN CONNECTIONS



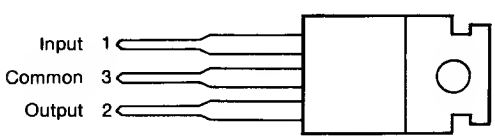
BA401 (FM-IF AMPLIFIER)

PIN CONNECTIONS



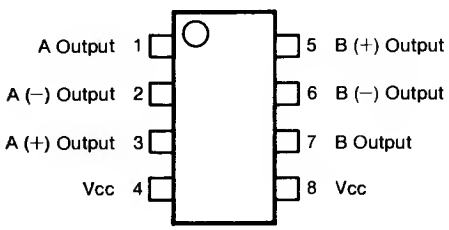
μA7808 (POSITIVE VOLTAGE REGULATOR)

PIN CONNECTIONS



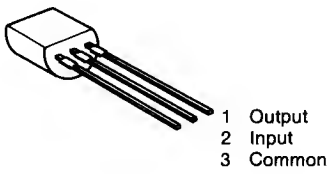
NJM4558D (DUAL LOW NOISE AMP)

PIN CONNECTIONS (Top View)



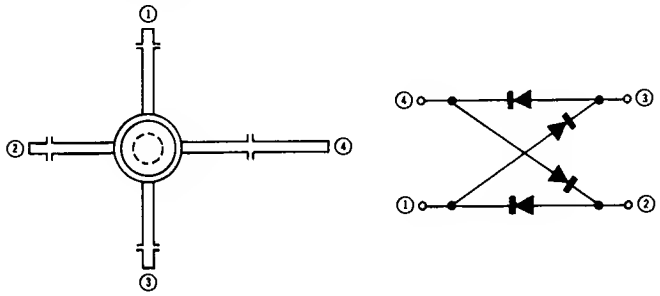
NJM79L05A (NEGATIVE VOLTAGE REGULATOR)

PIN CONNECTIONS



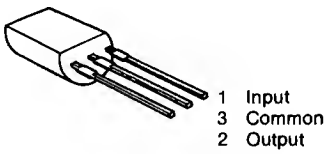
ND487C1-3R (DOUBLE BALANCED MIXER)

PIN CONNECTIONS



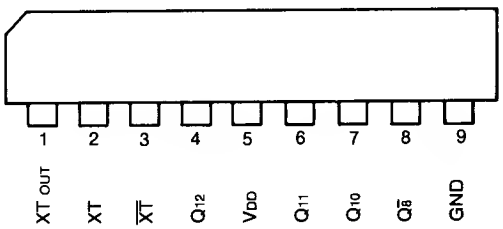
TA78L008AP (8V POSITIVE VOLTAGE REGULATOR)

PIN CONNECTIONS



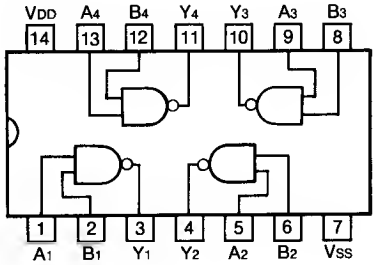
TC-5082P-GL (OSCILLATOR AND 12 STAGE DIVIDER)

PIN CONNECTIONS



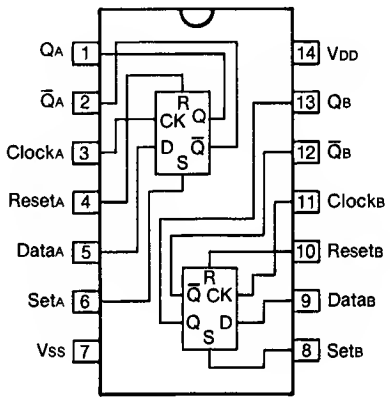
μPD4011BC (QUAD 2-INPUT NAND GATE)

PIN CONNECTIONS (Top View)



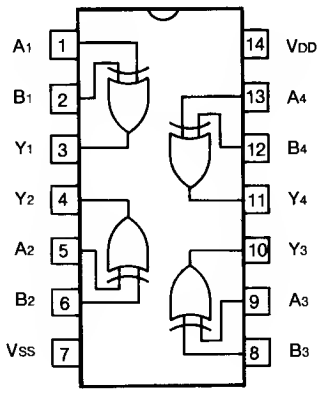
μPD4013BC (DUAL D-TYPE FLIP-FLOP)

PIN CONNECTIONS (Top View)



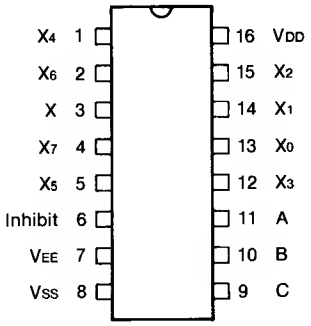
μPD4030BC (QUAD EXCLUSIVE OR GATE)

PIN CONNECTIONS (Top View)



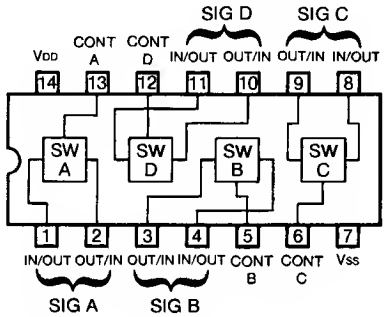
μPD4051BC (SINGLE 8-CHANNEL MULTIPLEXER)

PIN CONNECTIONS (Top View)



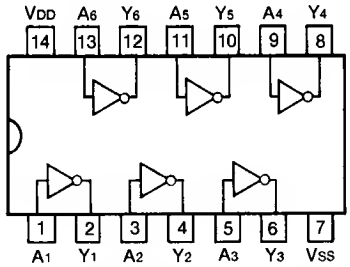
μPD4066BC (8-INPUT NAND GATE)

PIN CONNECTIONS (Top View)



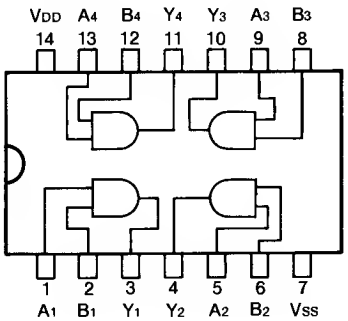
μPD4069UBC (HEX INVERTER)

PIN CONNECTIONS (Top View)



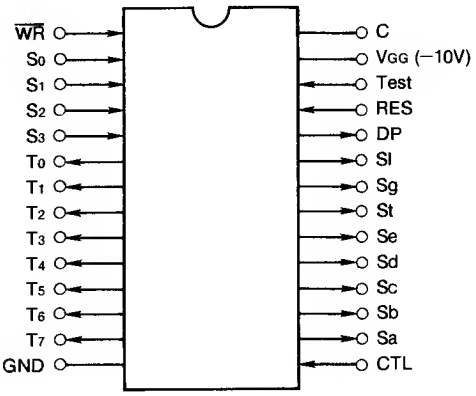
μPD4081BC (QUAD 2-INPUT AND GATE)

PIN CONNECTIONS (Top View)



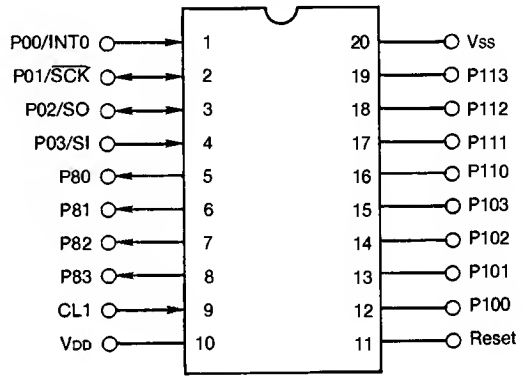
μPD549C (PROGRAMMABLE DISPLAY CONTROLLER)

PIN CONNECTIONS (Top View)



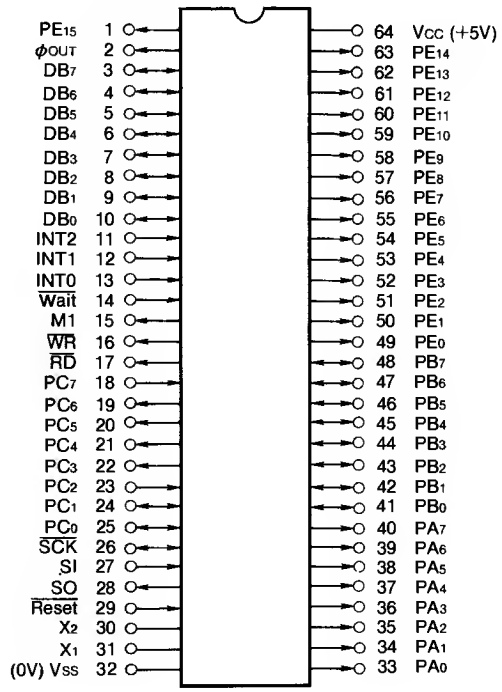
μPD7564 (1-CHIP 4-BIT MICRO COMPUTER)

PIN CONNECTIONS (Top View)



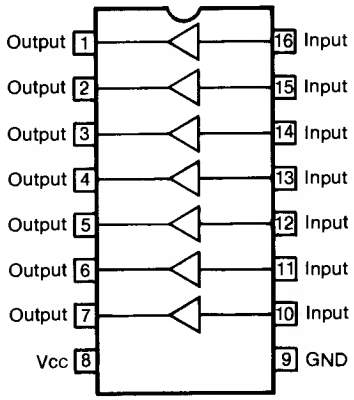
μPD7801G-114 (1 CHIP 8-BIT MICRO COMPUTER)

PIN CONNECTIONS (Top View)



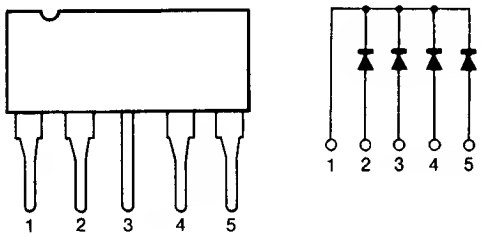
BA618 (CURRENT DRIVER)

PIN CONNECTIONS (Top View)



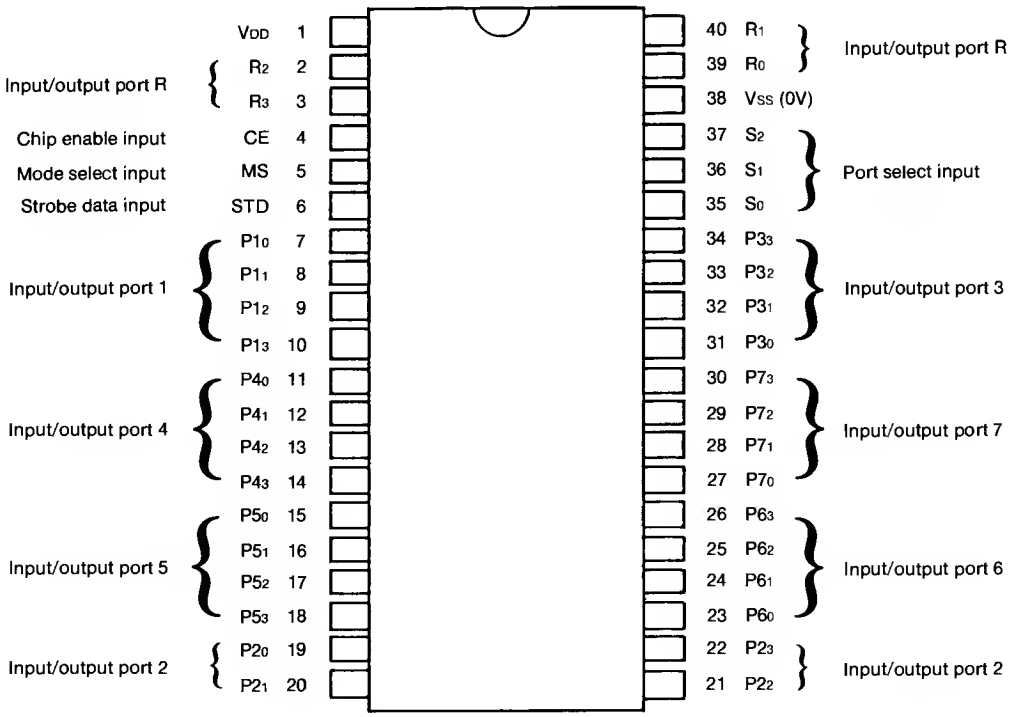
DAN401 (HIGH-SPEED SWITCHING DIODE ARRAY)

PIN CONNECTIONS



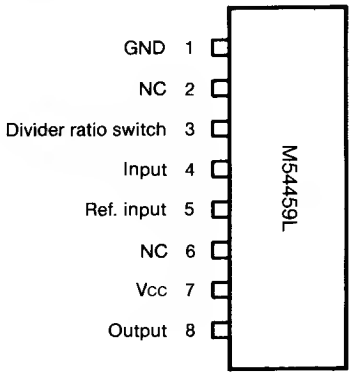
M50780SP (INPUT/OUTPUT EXPANDER)

PIN CONNECTIONS (Top View)



M54459L (1/20, 1/100 HIGH SPEED DIVIDER)

PIN CONNECTIONS

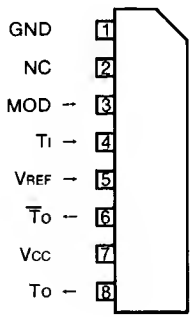


Frequency-division ratio switching input and frequency division ratio

DIVIDER RATIO SWITCH	LOW	HIGH
Frequency division ratio	1/20	1/100

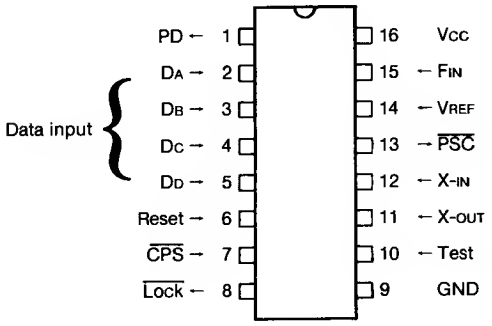
M54466L (1/10, 1/11 HIGH SPEED DIVIDER WITH ECL OUTPUT)

PIN CONNECTIONS



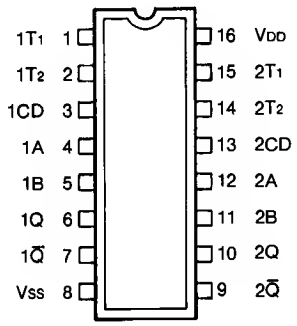
M54929P (PLL FREQUENCY SYNTHESIZER)

PIN CONNECTIONS (Top View)



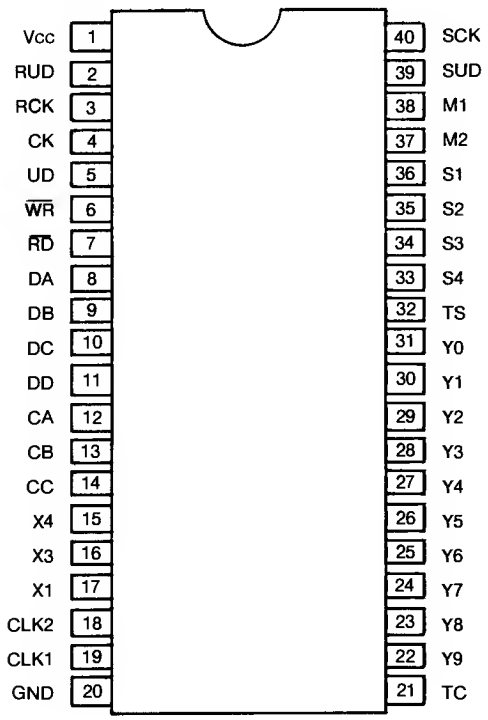
TC4528BP (DUAL MONOSTABLE MULTIVIBRATOR)

PIN CONNECTIONS (Top View)



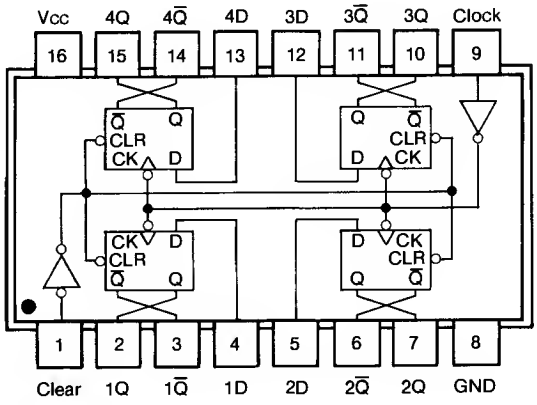
RP5G01-007 (ICOM DEVELOPED IC)

PIN CONNECTIONS (Top View)



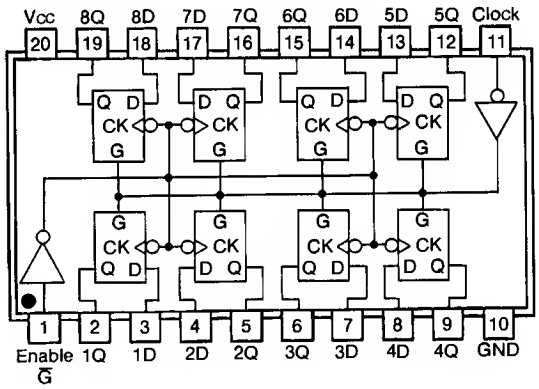
SN74LS175N (QUADRUPLE D-TYPE FLIP FLOP WITH RESET)

PIN CONNECTIONS (Top View)



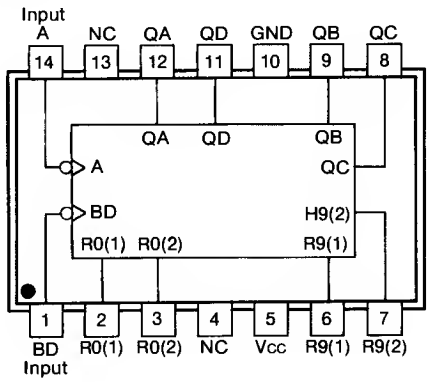
SN74LS377N (OCTAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP FLOP WITH ENABLE)

PIN CONNECTIONS (Top View)



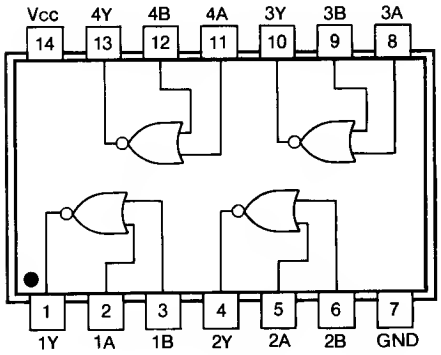
SN74LS90N (DECODE COUNTER)

PIN CONNECTIONS (Top View)



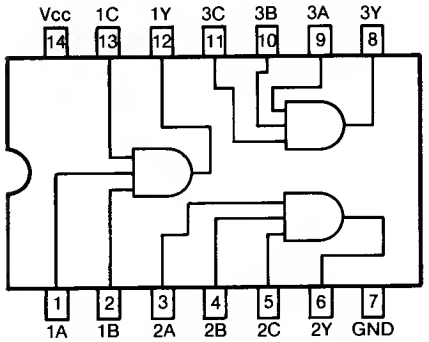
SN74LS02N (QUADRUPLE 2-INPUT POSITIVE NOR GATE)

PIN CONNECTIONS (Top View)



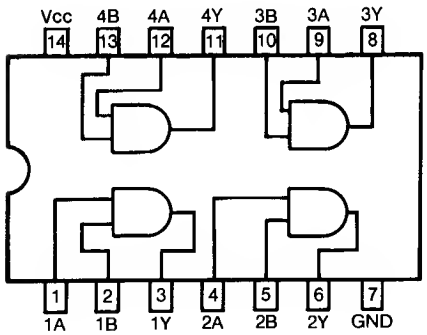
SN74LS11N (TRIPLE 3-INPUT POSITIVE AND GATE)

PIN CONNECTIONS (Top View)



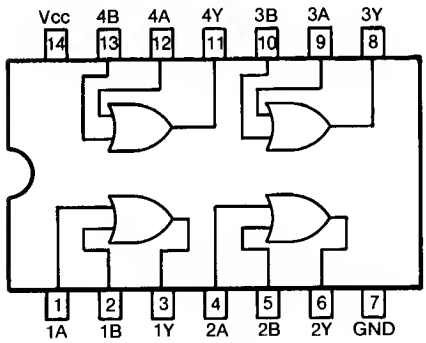
SN74LS08N (QUADRUPLE 2-INPUT POSITIVE AND GATE)

PIN CONNECTIONS (Top View)



SN74LS32N (QUADRUPLE 2-INPUT POSITIVE OR GATE)

PIN CONNECTIONS (Top View)



SECTION 10 PARTS LIST

10 - 1 EF UNIT

REF. NO.	DESCRIPTION	PART NO.
P1	Connector	TL25H-09-B1
P2	Connector	TL25H-13-B1
P3	Connector	TL25H-13-B1
P4	Connector	TL25H-03-B1
P5	Connector	TL25H-12-B1
P6	Connector	TL25H-10-B1
P7	Connector	TL25H-11-B1
P8	Connector	TL25H-06-B1
P9	Connector	TL25H-05-B1
P10	Connector	TL25H-07-B1
P11	Connector	TL25H-10-B1
P12	Connector	TL25H-03-B1
P13	Connector	TL25H-04-B1
P14	Connector	TL25H-08-B1
P15	Connector	TL25H-07-B1
P16	Connector	TL25H-09-B1
P17	Connector	TL25H-07-B1
P18	Connector	TL25H-07-B1
P19	Connector	TL25H-08-B1
P20	Connector	TL25H-08-B1
P21	Connector	TL25H-08-B1
P22	Connector	TL25H-08-B1
P23	Connector	TL25H-06-B1
P24	Connector	TL25H-03-B1
P25	Connector	TL25H-10-B1
P26	Connector	TL25H-12-B1
P27	Connector	TL25H-02-B1
P28	Connector	TL25H-12-B1
P29	Connector	TL25H-09-B1
P30	Connector	TL25H-03-B1
P31	Connector	TL25H-02-B1
P32	Connector	TL25H-03-B1
P33	Connector	TL25H-03-B1
P34	Connector	TL25H-04-B1
F1	Fuse	3A
SP1	Speaker	C065K12I0810
EP1	Ferrite Bead	FSQH070RN

10 - 2 FRONT UNIT

REF. NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SC2458-Y
Q2	Transistor	2SC1571-G
Q4	Transistor	2SA1348
Q5	Transistor	2SA1348
Q6	Transistor	2SC3399
Q7	Transistor	2SC3399
L1	Coil	LAL04NA 101K
L2	Coil	LAL04NA 101K
L4	Coil	FL5H 101K
L5	Coil	LAL04NA 101K
L6	Coil	FL5H 101K
L7	Coil	FL5H 101K
L8	Coil	FL5H 101K

FRONT UNIT

REF. NO.	DESCRIPTION	PART NO.
L9	Coil	BT01RN1-A61
L10	Coil	BT01RN1-A61
R1	Resistor	4.7k R25
R2	Resistor	27k ELR25
R3	Resistor	1.2k R25
R4	Resistor	680 R25
R5	Variable	RKBB21004A 10KB 500KC
R6	Variable	RKBA11013A 1MB
R7	Variable	RKBA11011A 1KB
R9	Variable	RKDEB0008A 10KBx2
R10	Variable	RKDEC000DA 10KA 10KBx2
R11	Variable	RKDEB0007A 10KA 10KB
R12	Trimmer	RHA3A140SA 10KB
R13	Trimmer	RHA3A140SA 10KB
R14	Trimmer	RHA3A140SA 10KB
R15	Variable	RKBBB001PA 10KBx2
R16	Resistor	47k R25
R17	Resistor	220 ELR20
R18	Resistor	1.5k ELR20
R19	Resistor	560 ELR20
R20	Resistor	18k R20
R21	Resistor	82k R20
R22	Resistor	100 ELR20
R23	Resistor	1k ELR20
R24	Resistor	47 R25
R25	Resistor	470 R20
R27	Resistor	100 ELR25
R28	Resistor	100 ELR25
R29	Resistor	2.2k R25
R30	Resistor	10k R25
R31	Resistor	47 R25
R32	Resistor	10k ELR25
R33	Resistor	4.7 R20
R34	Resistor	470 ELR20
R35	Resistor	3.3k R25
C2	Electrolytic	220 10V
C3	Barrier Layer	0.0047 25V
C4	Ceramic	0.0047 50V
C5	Electrolytic	47 10V
C6	Electrolytic	1 50V BP
C7	Ceramic	0.0047 50V
C8	Electrolytic	22 16V MS7
C9	Ceramic	0.0047 50V
C10	Electrolytic	1 50V
C11	Electrolytic	47 10V
C12	Ceramic	0.0047 50V
C13	Ceramic	0.0047 50V
C14	Ceramic	0.0047 50V
C15	Ceramic	0.0047 50V
C16	Ceramic	0.0047 50V
J1	Connector	TL25P-09-L1
J2	Connector	TL25P-03-L1
J3	Connector	TL25P-04-L1
J4	Connector	TL25P-13-L1
J5	Connector	TL25P-03-L1
J6	Connector	TL25P-13-L1
J7	Connector	TL25P-03-V1
J8	Connector	TL25P-12-L1

FRONT UNIT

REF. NO.	DESCRIPTION	PART NO.
J9	Connector	TL25P-10-L1
J10	Connector	HLJ4815-01-030
J11	Connector	TL25P-03-V1
J12	Connector	8S-S-E
J13	Connector	TL25P-11-V1
J14	Connector	TL25P-03-V1
P2	Connector	TL25H-03-B1
P3	Connector	1545P-1
P4	Connector	TL25H-02-B1
P5	Connector	TL25H-03-B1
P6	Connector	TL25H-03-B1
P7	Connector	TL25H-03-B1
P8	Connector	TL25H-05-B1
P9	Connector	TL25H-06-B1
P10	Connector	TL25H-03-B1
P11	Connector	TSL-P04P-B1
P12	Connector	TSL-P03P-B1
F1	Holder	TFH-S30
DS1	Lamp	BQ044-32582A
DS2	LED	SLB-22GG
DS3	LED	SLB-22GG
DS4	LED	SLB-22GG
ME1	Meter	M263A
S1	Switch	SPPJ31116A
S2	Switch	SPPJ31116A
S3	Switch	SPPJ31116A
S4	Switch	SRBU16003A
S5	Switch	SRRU13071A
S6	Switch	MS-621C
S7	Switch	MS-621C
S8	Switch	SPPJ31012A
S9	Switch	TW-0068
S10	Switch	M2012J-1K
S11	Encoder	RABF10J02A
S12	Encoder	RABH10J01A
EP1	P.C. Board	B-722E
EP2	P.C. Board	B-723C
EP3	P.C. Board	B-724C
EP4	P.C. Board	B-727E
EP5	P.C. Board	B-792
EP6	P.C. Board	B-731E
EP7	P.C. Board	B-741C
EP8	P.C. Board	B-1130A
EP9	P.C. Board	B-1133B
EP10	Ferrite Bead	FSQH050RN
W1	Jumper	JPW-02A
W2	Jumper	23/02/050/W02/W02
W3	Jumper	23/03/050/W02/W02
W4	Jumper	[51/99/160/W13A/W99A
W5	Jumper	08 A A]
W6	Jumper	[51/99/250/W13A/C01A
W7	Jumper	08 A A]
W8	Jumper	23/08/350/C01/D21
W9	Jumper	23/09/350/C01/D21
W11	Jumper	23/01/260/C01/D21

FRONT UNIT/DISPLAY UNIT

REF. NO.	DESCRIPTION	PART NO.
W12	Jumper	23/02/260/C01/D21
W13	Jumper	23/03/260/C01/D21
W14	Jumper	[51/99/400/C01A/W13A
W15	Jumper	08 A A]
W16	Jumper	23/04/160/W02/D21
W17	Jumper	23/00/160/W02/D21
W18	Jumper	74/98/015/X98/X98
W19	Jumper	23/09/400/C01/D21
W20	Jumper	23/00/400/C01/D21
W21	Jumper	23/01/400/C01/D21
W22	Jumper	23/02/520/C01/D21
W23	Jumper	23/03/520/C01/D21
W24	Jumper	23/04/520/C01/D21
W25	Jumper	23/05/520/C01/D21
W26	Jumper	23/06/520/C01/D21
W31	Jumper	23/01/300/C01/D21
W32	Jumper	23/02/300/C01/D21
W33	Jumper	23/03/300/C01/D21
W34	Jumper	23/04/300/C01/D21
W35	Jumper	23/05/300/C01/D21
W36	Jumper	23/06/300/C01/D21
W37	Jumper	23/07/300/C01/D21
W38	Jumper	23/08/300/C01/D21
W40	Jumper	13/00/120/W03/A07
W41	Jumper	13/01/120/W03/A07
W42	Jumper	13/02/250/W03/X99
W43	Jumper	23/01/150/W02/D21
W44	Jumper	23/02/150/W02/D21
W45	Jumper	23/03/150/W02/D21
W46	Jumper	JPW-02A
W47	Jumper	JPW-02H
W49	Jumper	IPS-1041-2
W50	Jumper	23/00/110/W02/C02
W52	Jumper	23/02/160/C02/W01
W53	Jumper	23/03/140/C02/W01
W54	Jumper	23/04/120/C02/W01
W55	Jumper	23/05/125/C02/W01
W56	Jumper	23/06/110/C02/W02

10 - 3 DISPLAY UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μPD549C
IC2	IC	μPD549C
IC3	IC	μA78L05
IC4	IC	NJM79L05A
Q1	Transistor	2SA1015-Y
Q2	Transistor	2SA1015-Y
Q3	Transistor	2SA1015-Y
Q4	Transistor	2SC1214
Q5	Transistor	2SC1214
Q6	Transistor	2SA1015-Y
Q7	Transistor	2SC2458-GR
Q8	Transistor	2SC3402
D1	Diode	1SS55
D2	Diode	1SS55
D3	Diode	1SS55
D4	Diode	1SS55

DISPLAY UNIT

REF. NO.	DESCRIPTION	PART NO.
D5	Diode	1SS55
D6	Diode	1SS55
D7	Diode	1SS55
D8	Diode	1SS55
D9	Diode	1SS55
D10	Diode	1SS55
D11	Diode	1SS55
D13	Diode	1SS55
D14	Zener	RD6.2E B2
D15	Diode	1SS55
D16	Diode	1SS55
D17	Diode	1SS55
D18	Diode	1SS55
D19	Diode	1SS55
D21	Diode	1SS53
L1	Coil	FL5H 101K
L2	Coil	FL9H 471K
L3	Coil	LAL04NA 101K
R1	Resistor	1k ELR25
R2	Resistor	1k ELR25
R3	Resistor	1k ELR25
R4	Resistor	1k R25
R5	Resistor	1k ELR25
R6	Resistor	1k ELR25
R7	Resistor	1k ELR25
R8	Resistor	1k ELR25
R9	Resistor	1k ELR25
R10	Resistor	1k ELR25
R11	Array	RMX-6 47k
R12	Array	RMX-10 47k
R13	Array	RMX-6 47k
R14	Array	RMX-8 47k
R15	Resistor	47k ELR25
R16	Resistor	47k ELR25
R17	Resistor	47k ELR25
R18	Resistor	2.7k ELR25
R19	Resistor	2.7k ELR25
R20	Resistor	2.7k ELR25
R21	Resistor	2.7k ELR25
R22	Resistor	2.7k ELR25
R23	Resistor	2.7k ELR25
R24	Resistor	2.7k ELR25
R25	Resistor	2.7k ELR25
R26	Resistor	2.7k ELR25
R27	Resistor	2.7k ELR25
R28	Resistor	2.7k ELR25
R29	Array	RMX-10 47k
R30	Resistor	47k ELR25
R31	Resistor	47k R25
R32	Resistor	3.3k ELR25
R33	Resistor	3.3k R20
R34	Resistor	2.2 ELR25
R35	Resistor	47 ELR25
R36	Resistor	2.2k ELR25
R37	Resistor	2.2k ELR25
R40	Resistor	1k ELR25
R41	Resistor	100k ELR25
R42	Resistor	2.2k ELR25
R44	Resistor	220 R25
R45	Resistor	220 R25

DISPLAY UNIT

REF. NO.	DESCRIPTION	PART NO.
R46	Resistor	220 R25
R47	Resistor	22 R20
C1	Array	B5RC0124-32N 0.001x4
C2	Ceramic	0.001 50V
C3	Array	B5RC0124-32N 0.001x4
C4	Ceramic	0.001 50V
C5	Ceramic	0.001 50V
C6	Ceramic	0.001 50V
C7	Ceramic	0.001 50V
C8	Ceramic	0.001 50V
C9	Ceramic	0.001 50V
C10	Ceramic	0.0047 50V
C11	Ceramic	0.0047 50V
C12	Ceramic	0.0047 50V
C13	Array	B8ZC0111-32N 0.0082x7
C14	Ceramic	0.0047 50V
C15	Ceramic	330P 50V
C16	Ceramic	330P 50V
C17	Electrolytic	33 16V
C18	Electrolytic	4.7 25V RC2
C19	Electrolytic	3.3 50V RC2
C20	Electrolytic	3.3 50V RC2
C21	Electrolytic	0.1 50V RC2
C22	Electrolytic	10 16V RC2
C23	Electrolytic	10 16V RC2
C24	Electrolytic	10 16V RC2
C25	Electrolytic	10 16V RC2
C26	Mylar	0.01 50V
J1	Connector	TL25P-06-V1
J2	Connector	TL25P-03-V1
P1	Connector	TL25H-04-B1
DS1	FLD	FIP12FM7
DS2	LED	SLB-22UR
DS3	LED	SLB-22GG
DS4	LED	SLB-22YY
T1	Transformer	TO-9
EP1	P.C. Board	B-706D
EP2	P.C. Board	B-729A
EP3	Ribbon Cable	B-785
EP4	Ribbon Cable	B-786
W1	Jumper	23/01/180/W07/W07
W2	Jumper	23/02/150/W07/W07
W3	Jumper	23/03/180/W07/W07
W4	Jumper	23/04/190/W07/W02
W5	Jumper	23/05/150/W07/W07
W6	Jumper	23/06/150/W07/W07
W7	Jumper	23/07/160/W07/W07
W8	Jumper	23/08/160/W07/W07
W9	Jumper	23/09/160/W07/W07
W10	Jumper	23/00/120/W07/W07
W11	Jumper	23/01/120/W07/W07
W12	Jumper	23/02/120/W07/W07
W13	Jumper	JPW-02A
W14	Jumper	JPW-02A
W15	Jumper	JPW-02A

DISPLAY UNIT/LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
W16	Jumper	IPS-1041-4
W17	Jumper	JPW-02A
W18	Jumper	IPS-1041-4
W19	Jumper	IPS-1041-4
W20	Jumper	JPW-02H
W21	Jumper	JPW-02H
W22	Jumper	JPW-02H
W23	Jumper	JPW-02H
W24	Jumper	JPW-02H
W25	Jumper	JPW-02H
W26	Jumper	IPS-1041-4
W27	Jumper	IPS-1041-4
W28	Jumper	IPS-1041-4
W29	Jumper	IPS-1041-4
W30	Jumper	IPS-1041-4
W31	Jumper	JPW-02H
W32	Jumper	JPW-02H
W33	Jumper	JPW-02H
W34	Jumper	JPW-02H
W35	Jumper	IPS-1041-4
W36	Jumper	JPW-02H
W37	Jumper	IPS-1041-4
W38	Jumper	JPW-02A
W39	Jumper	JPW-02H
W40	Jumper	IPS-1041-4
W41	Jumper	IPS-1041-4
W42	Jumper	IPS-1041-4
W43	Jumper	JPW-02A
W44	Jumper	IPS-1041-4
W45	Jumper	IPS-1041-4
W46	Jumper	JPW-02A
W47	Jumper	JPW-02A
W48	Jumper	JPW-02A
W49	Jumper	JPW-02H
W50	Jumper	23/00/190/C01/W02
W51	Jumper	23/01/190/C01/W02
W52	Jumper	23/02/190/C01/W02
W53	Jumper	23/03/190/C01/W02

10 - 4 LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μA7805
IC2	IC	RP5G01 007
IC3	IC	μPD7801G 114
IC4	IC	SN74LS08N
IC5	IC	SN74LS32N
IC6	IC	SNS74LS02N
IC7	IC	μPD4013BC
IC8	IC	TC4528BP
IC9	IC	SN74LS377N
IC10	IC	SN74LS11N
IC11	IC	SN74LS175N
IC12	IC	BA618
IC13	IC	BA618
IC14	IC	M50780SP
IC15	IC	BA618
IC16	IC	DAN401
IC17	IC	SN74LS08N
IC18	IC	SN74LS08N
IC19	IC	TA78L008AP

LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SA1048-Y
Q2	Transistor	2SA1048-Y
Q3	Transistor	2SA1048-Y
Q4	Transistor	2SC2458-GR
Q5	Transistor	2SC2458-GR
Q6	Transistor	2SA1348
Q7	Transistor	2SA1348
Q8	Transistor	2SA1348
Q9	Transistor	2SA1348
Q10	Transistor	2SA1348
Q11	Transistor	2SA1348
Q12	Transistor	2SA1348
Q13	Transistor	2SA1348
Q14	Transistor	2SA1348
Q15	Transistor	2SA1348
Q16	Transistor	2SA1348
Q17	Transistor	2SC3399
Q18	Transistor	2SC3399
Q19	Transistor	2SB562-C
Q20	Transistor	2SC3399
Q21	Transistor	2SC3399
D1	Diode	1SS53
D2	Diode	1SS53
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1SS53
D23	Diode	1SS53
D24	Diode	1SS53
D25	Diode	1SS53
D26	Diode	1SS53
D27	Diode	1SS53
D28	Diode	1SS53
D29	Diode	1SS53
D30	Diode	1SS53
D31	Diode	1SS53
D32	Diode	1SS53
D33	Diode	1SS53
D34	Diode	1SS53
D35	Diode	1SS53
D36	Diode	1SS53
X1	Ceramic Resonator	CSA400MT
L1	Coil	FL5H 102K
L3	Coil	BT01RN1-A61

LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
L4	Coil	FL5H 102K
L5	Coil	FL5H 102K
L6	Coil	FL5H 102K
L7	Coil	FL5H 102K
L8	Coil	FL5H 102K
L9	Coil	FL5H 102K
L10	Coil	FL5H 102K
L11	Coil	FL5H 101K
L12	Coil	FL5H 101K
L13	Coil	FL5H 101K
L14	Coil	FL5H 101K
L15	Coil	FL5H 101K
L16	Coil	FL5H 101K
L17	Coil	FL5H 101K
L18	Coil	EL0810SKI 102K
R1	Resistor	4.7k ELR25
R2	Resistor	47k R25
R3	Resistor	10k R20
R4	Resistor	47k R20
R5	Resistor	470 ELR25
R6	Array	RMX-4 100k
R7	Resistor	120k ELR25
R8	Resistor	10k R25
R10	Resistor	47k R25
R11	Resistor	3.3M ELR25
R12	Resistor	1M ELR20
R13	Resistor	33 ELR25
R14	Trimmer	RHA3A160AA 1MB
R15	Resistor	220k ELR25
R16	Resistor	47k ELR25
R17	Resistor	1M R20
R18	Resistor	1M R25
R19	Resistor	47k R25
R20	Resistor	10 R50X
R21	Resistor	10k R25
R22	Array	RMX-8 4.7k
R23	Resistor	68k ELR20
R24	Resistor	4.7k ELR25
R25	Resistor	10k R25
R26	Resistor	1k ELR25
R27	Array	RMX-4 4.7k
R28	Resistor	47k R20
R29	Resistor	750 CRB25FX
R30	Resistor	1.8k CRB25FX
R31	Resistor	3.3k CRB25FX
R32	Resistor	5.6k CRB25FX
R33	Resistor	10k CRB25FX
R34	Resistor	4.7k CRB25FX
R35	Resistor	1k R25
R36	Resistor	1k R25
R37	Resistor	1k R25
R38	Resistor	1k R25
R39	Resistor	1k R25
R40	Resistor	1k R25
R41	Resistor	1k R25
R42	Resistor	1k R25
R43	Resistor	1k R25
R44	Resistor	1k R25
R45	Resistor	1k R25
R46	Resistor	1k R25
R47	Resistor	1k R25

LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
R48	Resistor	1k R25
R49	Resistor	1k R25
R50	Resistor	1k R25
R51	Resistor	1k R25
R53	Resistor	220 ELR25
R54	Resistor	10k ELR25
R55	Resistor	10k R25
R58	Resistor	10k ELR20
R59	Resistor	10k R20
R60	Resistor	3.3k R20
R61	Resistor	10k R20
R64	Resistor	10k R20
R65	Resistor	10k R20
C1	Electrolytic	33 16V
C2	Barrier Layer	0.1 16V
C3	Barrier Layer	0.1 16V
C4	Electrolytic	47 10V
C5	Electrolytic	1 50V
C6	Barrier Layer	0.1 16V
C7	Mylar	0.0022 50V
C8	Mylar	0.001 50V
C9	Mylar	0.001 50V
C10	Barrier Layer	0.1 16V
C11	Ceramic	33P 50V
C12	Ceramic	33P 50V
C13	Barrier Layer	0.1 16V
C14	Barrier Layer	0.047 25V
C15	Electrolytic	1 50V BP
C16	Ceramic	0.0047 50V
C17	Barrier Layer	0.1 16V
C18	Electrolytic	47 10V
C19	Barrier Layer	0.1 16V
C20	Array	B8ZC0111-32N 0.0082x7
C21	Ceramic	470P 50V
C22	Ceramic	0.001 50V
C23	Electrolytic	2.2 50V MS7
C24	Ceramic	0.0022 50V
C25	Ceramic	0.001 50V
C26	Array	B8ZC0111-32N 0.0082x7
C27	Array	B5RC0124-32N 0.001x4
C28	Array	B7ZC0711-32N 0.01x6
C29	Array	B7ZC0711-32N 0.01x6
C30	Barrier Layer	0.1 16V
C31	Barrier Layer	0.1 16V
C32	Barrier Layer	0.1 16V
C33	Ceramic	0.0047 50V
C34	Ceramic	0.0047 50V
C35	Ceramic	0.0047 50V
J1	Connector	TL25P-03-V1
J2	Connector	TL25P-10-V1
J3	Connector	TL25P-12-V1
J4	Connector	TL25P-05-V1
J5	Connector	5138-11CPB
J6	Connector	3022-06B
J7	Connector	5138-10CPB
J8	Connector	5138-04CPB
J9	Connector	TL25P-07-V1
J10	Connector	TL25P-09-V1
J11	Connector	5138-11CPB
J12	Connector	TL25P-08-V1

LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
J13	Connector	5138-10CPB
J14	Connector	5138-08CPB
J15	Connector	TL25P-08-V1
J16	Connector	3022-12B
J17	Connector	3022-08B
J18	Connector	TL25P-06-L1
J19	Connector	TL25P-03-L1
J20	Connector	3022-02B
J21	Connector	3022-02B
P1	Connector	TL25H-03-B1
S1	Thermal	OHD3-50M
EP1	P.C. Board	B-705E
EP2	P.C. Board	B-1036A
EP3	Ram Unit	EX-314-01
EP8	P.C. Board	B-1131A
W1	Jumper	23/00/200/D21/D21
W2	Jumper	23/01/200/D21/D21
W3	Jumper	23/02/140/D21/D21
W4	Jumper	23/03/180/D21/D21
W5	Jumper	23/04/170/D21/D21
W6	Jumper	23/05/170/D21/D21
W7	Jumper	23/06/160/D21/D21
W8	Jumper	23/07/220/D21/D21
W9	Jumper	23/08/080/D21/D21
W10	Jumper	23/09/080/D21/D21
W11	Jumper	23/00/070/D21/D21
W12	Jumper	23/01/140/D21/D21
W13	Jumper	23/02/100/D21/D21
W14	Jumper	23/03/100/D21/D21
W15	Jumper	IPS-1041-4
W16	Jumper	IPS-1041-4
W17	Jumper	IPS-1041-2
W18	Jumper	IPS-1041-4
W19	Jumper	IPS-1041-2
W20	Jumper	IPS-1041-4
W21	Jumper	IPS-1041-4
W22	Jumper	IPS-1041-4
W23	Jumper	IPS-1041-2
W24	Jumper	IPS-1041-4
W26	Jumper	IPS-1041-4
W27	Jumper	IPS-1041-4
W28	Jumper	IPS-1041-4
W29	Jumper	IPS-1041-4
W30	Jumper	IPS-1041-4
W31	Jumper	IPS-1041-2
W32	Jumper	IPS-1041-4
W33	Jumper	IPS-1041-4
W34	Jumper	IPS-1041-2
W35	Jumper	IPS-1041-4
W36	Jumper	IPS-1041-2
W37	Jumper	IPS-1041-4
W38	Jumper	JPW-02A
W39	Jumper	IPS-1041-4
W40	Jumper	JPW-02A
W41	Jumper	IPS-1041-4
W42	Jumper	JPW-02H
W43	Jumper	IPS-1041-4
W44	Jumper	IPS-1041-4

LOGIC UNIT

REF. NO.	DESCRIPTION	PART NO.
W45	Jumper	JPW-02H
W46	Jumper	IPS-1041-2
W47	Jumper	IPS-1041-4
W48	Jumper	IPS-1041-4
W49	Jumper	JPW-02A
W50	Jumper	IPS-1041-4
W51	Jumper	IPS-1041-2
W52	Jumper	IPS-1041-2
W53	Jumper	IPS-1041-2
W54	Jumper	IPS-1041-4
W55	Jumper	JPW-02A
W56	Jumper	IPS-1041-4
W57	Jumper	IPS-1041-4
W58	Jumper	IPS-1041-4
W59	Jumper	IPS-1041-4
W60	Jumper	IPS-1041-4
W61	Jumper	IPS-1041-4
W62	Jumper	IPS-1041-4
W63	Jumper	IPS-1041-2
W64	Jumper	IPS-1041-4
W65	Jumper	IPS-1041-4
W66	Jumper	IPS-1041-4
W67	Jumper	IPS-1041-4
W68	Jumper	IPS-1041-4
W69	Jumper	IPS-1041-4
W70	Jumper	IPS-1041-4
W71	Jumper	IPS-1041-4
W72	Jumper	IPS-1041-4
W73	Jumper	IPS-1041-4
W74	Jumper	IPS-1041-4
W75	Jumper	IPS-1041-4
W76	Jumper	JPW-02A
W77	Jumper	IPS-1041-4
W78	Jumper	IPS-1041-2
W79	Jumper	IPS-1041-2
W80	Jumper	IPS-1041-2
W81	Jumper	IPS-1041-4
W82	Jumper	IPS-1041-4
W83	Jumper	IPS-1041-4
W84	Jumper	IPS-1041-4
W85	Jumper	IPS-1041-4
W86	Jumper	IPS-1041-4
W87	Jumper	IPS-1041-4
W88	Jumper	IPS-1041-4
W89	Jumper	IPS-1041-4
W90	Jumper	IPS-1041-4
W91	Jumper	IPS-1041-4
W92	Jumper	IPS-1041-4
W93	Jumper	IPS-1041-4
W94	Jumper	IPS-1041-2
W95	Jumper	IPS-1041-2
W96	Jumper	IPS-1041-4
W97	Jumper	IPS-1041-2
W98	Jumper	JPW-02A
W99	Jumper	JPW-02A
W100	Jumper	JPW-02A
W101	Jumper	JPW-02A
W102	Jumper	JPW-02A
W103	Jumper	JPW-02A
W104	Jumper	IPS-1041-4
W105	Jumper	23/05/320/D21/C01
W107	Jumper	23/07/250/D21/C01

LOGIC UNIT/MATRIX UNIT

REF. NO.	DESCRIPTION	PART NO.
W108	Jumper	JPW-02A
W109	Jumper	JPW-02A
W110	Jumper	IPS-1041-2
W111	Jumper	IPS-1041-2
W112	Jumper	IPS-1041-2
W113	Jumper	IPS-1041-2
W114	Jumper	IPS-1041-4
W115	Jumper	IPS-1041-4

10 - 5 MATRIX UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μPD4013BC
IC2	IC	μPD4013BC
IC3	IC	μPD4011BC
IC4	IC	μPD4030BC
IC5	IC	μPD4081BC
Q1	Transistor	32SA1048-Y
Q2	Transistor	2SC2458-GR
Q3	Transistor	2SC2458-GR
Q4	Transistor	2SC3399
Q5	Transistor	2SC3399
Q6	Transistor	2SC2458-GR
Q7	Transistor	2SA1048-Y
Q8	Transistor	2SC2458-GR
Q9	Transistor	2SC3399
Q10	Transistor	2SC2458-GR
Q13	Transistor	2SC2458-GR
Q14	Transistor	2SC2458-GR
Q15	Transistor	2SC2458-GR
Q16	Transistor	2SC2458-GR
Q17	Transistor	2SC2458-GR
Q18	Transistor	2SC2458-GR
Q19	Transistor	2SC2458-GR
Q20	Transistor	2SA1048-Y
Q21	Transistor	2SC2458-GR
Q23	Transistor	2SA1348
Q24	Transistor	2SA1348
D2	Diode	1SS53
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53

MATRIX UNIT

REF. NO.	DESCRIPTION	PART NO.	
D22	Diode	1SS53	
D23	Diode	1SS53	
D24	Diode	1SS53	
D25	Diode	1SS53	
D26	Diode	1SS53	
D27	Diode	1SS53	
D28	Diode	1SS53	
D29	Diode	1SS53	
D30	Diode	1SS53	
D31	Diode	1SS53	
D32	Diode	1SS53	
D33	Diode	1SS53	
D34	Diode	1SS53	
D35	Diode	1SS53	
D36	Diode	1SS53	
D37	Diode	1SS53	
D38	Diode	1SS53	
D39	Diode	1SS53	
D40	Diode	1SS53	
D41	Diode	1SS53	
R1	Resistor	10k	ELR25
R2	Resistor	10k	ELR25
R3	Resistor	680k	ELR25
R4	Resistor	47k	R25
R5	Resistor	1M	ELR25
R6	Resistor	47k	ELR25
R7	Resistor	47k	ELR25
R8	Resistor	22k	R25
R9	Resistor	47k	ELR25
R10	Resistor	47k	R25
R11	Resistor	1M	ELR25
R12	Resistor	1M	ELR25
R13	Resistor	47k	ELR25
R14	Resistor	1M	ELR25
R15	Resistor	3.3M	ELR25
R16	Resistor	330k	ELR25
R17	Resistor	47k	ELR25
R18	Resistor	47k	R25
R19	Resistor	47k	R25
R20	Resistor	47k	ELR25
R21	Resistor	470k	ELR25
R22	Resistor	10k	ELR25
R26	Resistor	47k	ELR25
R27	Resistor	47k	ELR25
R28	Resistor	47k	ELR25
R29	Resistor	47k	ELR25
R30	Resistor	47k	ELR25
R31	Array	RMX-6	10k
R32	Resistor	47k	ELR25
R33	Resistor	47k	R25
R34	Resistor	47k	ELR25
R35	Resistor	1M	ELR25
R36	Resistor	1M	ELR25
R37	Resistor	47k	R20
R38	Resistor	47k	R20
R39	Resistor	6.8k	R20
R40	Resistor	47k	ELR25
R41	Resistor	4.7	ELR25
R44	Resistor	270	ELR25
R45	Resistor	270	R25
R46	Resistor	270	ELR25

MATRIX UNIT

REF. NO.	DESCRIPTION	PART NO.
R47	Resistor	10k R20
R48	Resistor	10k R25
R49	Resistor	1k ELR20
C1	Barrier Layer	0.1 16V
C2	Barrier Layer	0.1 16V
C3	Barrier Layer	0.1 16V
C4	Barrier Layer	0.1 16V
C5	Barrier Layer	0.1 16V
C6	Electrolytic	0.47 50V BP
C7	Array	B7ZC0711-32N 0.01x6
C8	Barrier Layer	0.1 16V
C9	Array	B8ZC0111-32N 0.0082x7
C10	Barrier Layer	0.1 16V
C11	Barrier Layer	0.1 16V
C12	Ceramic	0.001 50V
C13	Ceramic	0.001 50V
J1	Connector	5138-15APB
J2	Connector	TLB-P06H-B1
J3	Connector	TSL-P04P-B1
J4	Connector	TSL-P03P-B1
P1	Connector	TL25H-06-B1
P2	Connector	TL25H-03-B1
P3	Connector	TL25H-05-B1
P4	Connector	TL25H-06-B1
DS1	LED	SLB-22UR
S1	Switch	SPPH15029A
S2	Switch	SPPH15029A
S3	Switch	SPPH15009A
S4	Switch	SPPH15029A
S5	Switch	SPPH15029A
S6	Switch	SPPH15029A
S7	Switch	SPPH15029A
S8	Switch	SPPH15029A
S9	Switch	SPPH11163A
S10	Switch	SSSS21148A
S11	Switch	SPPH15029A
S12	Switch	SPPH15029A
S13	Switch	SPPH15009A
S14	Switch	SPPH15029A
S15	Switch	SPPH15029A
S16	Switch	SPPH15029A
S17	Switch	SPPH15009A
S18	Switch	SPPH15029A
S19	Switch	SPPH15009A
S20	Switch	SPPH15029A
S21	Switch	SPPH15029A
S22	Switch	SPPH15009A
S23	Switch	SPPH15009A
S24	Switch	SPPH15009A
EP1	P.C. Board	B-728C
EP2	P.C. Board	B-726G
EP3	P.C. Board	B-725A
EP4	Ribbon Cable	B-787
EP5	Ribbon Cable	B-788
EP6	Ribbon Cable	B-789

MATRIX UNIT

REF. NO.	DESCRIPTION	PART NO.
W1	Jumper	23/01/160/D21/D21
W2	Jumper	23/02/120/D21/D21
W3	Jumper	23/03/100/D21/D21
W4	Jumper	IPS-1041-4
W5	Jumper	IPS-1041-4
W6	Jumper	IPS-1041-4
W7	Jumper	IPS-1041-4
W8	Jumper	IPS-1041-2
W9	Jumper	IPS-1041-2
W10	Jumper	IPS-1041-4
W11	Jumper	IPS-1041-4
W12	Jumper	IPS-1041-2
W13	Jumper	IPS-1041-4
W14	Jumper	IPS-1041-4
W15	Jumper	IPS-1041-4
W16	Jumper	IPS-1041-4
W17	Jumper	IPS-1041-4
W18	Jumper	IPS-1041-2
W19	Jumper	IPS-1041-4
W20	Jumper	IPS-1041-4
W21	Jumper	JPW-02A
W22	Jumper	IPS-1041-2
W23	Jumper	IPS-1041-2
W24	Jumper	IPS-1041-2
W25	Jumper	IPS-1041-4
W26	Jumper	IPS-1041-4
W27	Jumper	IPS-1041-4
W28	Jumper	IPS-1041-4
W29	Jumper	JPW-02H
W30	Jumper	IPS-1041-4
W31	Jumper	IPS-1041-4
W32	Jumper	IPS-1041-2
W33	Jumper	IPS-1041-4
W34	Jumper	IPS-1041-4
W35	Jumper	IPS-1041-2
W36	Jumper	IPS-1041-4
W37	Jumper	IPS-1041-2
W38	Jumper	IPS-1041-4
W39	Jumper	IPS-1041-4
W40	Jumper	IPS-1041-4
W41	Jumper	IPS-1041-4
W42	Jumper	IPS-1041-2
W43	Jumper	IPS-1041-4
W46	Wire	23/00/240/C01/D21
W47	Wire	23/01/210/C01/D21
W48	Wire	23/00/380/C01/C22
W49	Wire	23/01/380/C01/C22
W50	Wire	23/02/380/C01/C22
W51	Wire	23/03/380/C01/C22
W52	Wire	23/04/380/C01/C22
W53	Wire	23/05/380/C01/C22
W54	Wire	23/00/200/C01/W02
W55	Wire	23/01/200/C01/W02
W56	Wire	23/02/200/C01/W02
W57	Wire	23/03/200/C01/W02
W58	Wire	23/04/200/C01/W02
W59	Jumper	JPW-02H
W60	Jumper	IPS-1041-4
W62	Wire	23/02/490/C01/W02
W63	Wire	23/03/490/C01/W02
W64	Wire	23/04/490/C01/W02

MATRIX UNIT/PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
W65	Wire	23/05/490/C01/W02
W66	Wire	23/06/490/C01/W02
W67	Wire	23/07/490/C01/W02
W69	Jumper	IPS-1041-4
W70	Jumper	IPS-1041-4
W71	Jumper	IPS-1041-2
W72	Jumper	IPS-1041-4
W73	Jumper	IPS-1041-2
W74	Jumper	IPS-1041-2
W75	Jumper	IPS-1041-4
W76	Wire	23/06/115/D21/D21
W77	Wire	23/07/110/D21/D21

10 - 6 PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	M54929P
IC2	IC	M54466L
IC3	IC	μPC1037H
IC4	IC	μPC1037H
IC5	IC	SN74LS90N
IC6	IC	TC5082P-GL
IC7	IC	TA78L008AP
IC8	IC	μA7805
IC201	IC	M54929P
IC202	IC	M54466L
IC203	IC	SN74LS90N
IC204	IC	M54459L
Q1	Transistor	2SC945-P
Q2	Transistor	2SC945-P
Q3	Transistor	2SC945-P
Q4	Transistor	2SC945-P
Q5	FET	2SK30A-Y
Q6	FET	2SK30A-Y
Q7	Transistor	2SC1571-G
Q8	Transistor	2SA1015-Y
Q9	Transistor	2SC945-P
Q10	Transistor	2SC945-R
Q11	Transistor	2SC383-TM
Q12	Transistor	2SC945-P
Q13	Transistor	2SC3399
Q14	Transistor	2SC383-TM
Q15	FET	2SK241-Y
Q16	Transistor	2SC383-TM
Q17	Transistor	2SC383-TM
Q18	FET	2SK192A-GR
Q19	FET	2SK192A-GR
Q20	FET	2SK192A-GR
Q21	FET	2SK192A-GR
Q22	Transistor	2SC383-TM
Q23	Transistor	2SC383-TM
Q24	Transistor	2SC945-P
Q25	Transistor	2SC383-TM
Q26	Transistor	2SC383-TM
Q201	FET	2SK192A-GR
Q202	Transistor	2SC763-C
D1	Varicap	1SV50E
D2	Zener	RD5.1E B2
D4	Diode	1SS53

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
D5	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Varicap	FC52M
D13	Varicap	1SV50E
D14	Varicap	1SV50E
D15	Varicap	1SV50E
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Zener	RD5.1E B2
D201	Varicap	1SV50E
D202	Diode	1SS237
D203	Diode	1SS237
FI1	Monolithic	FL-69
X1	Crystal	CR-21
L1	Coil	LW-19
L2	Coil	LS-94
L3	Coil	LS-114
L4	Coil	LS-114
L5	Coil	LS-114
L6	Coil	LAL04NA 102K
L7	Coil	EL0810SKI 101K
L8	Coil	LS-162
L9	Coil	LA-244
L10	Coil	LA-254
L11	Coil	LB4 R36
L12	Coil	LB4 R23
L13	Coil	LW-20
L14	Coil	FL5H 101K
L15	Coil	FL5H 101K
L16	Coil	LR-79
L17	Coil	LB-135
L18	Coil	LW-25
L19	Coil	LR-79
L20	Coil	LB-135
L21	Coil	LW-25
L22	Coil	LR-79
L23	Coil	LB-135
L24	Coil	LW-25
L25	Coil	LR-79
L26	Coil	LB-135
L27	Coil	LW-25
L28	Coil	BT01RN1-A61
L29	Coil	LAL03NA R56M
L30	Coil	LAL04NA 101K
L31	Coil	LAL04NA 101K
L32	Coil	LAL03NA 100K
L33	Coil	BT01RN1-A61
L34	Coil	BT01RN1-A61
L201	Coil	LB-113
L202	Coil	LW-25
L203	Coil	FL5H 101K
L204	Coil	LAL03NA 101K
L205	Coil	LAL04NA 101K
L206	Coil	LAL04NA 101K

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.	
R1	Resistor	1k	R25
R2	Resistor	2.2k	ELR25
R3	Resistor	4.7k	ELR25
R4	Resistor	10k	ELR25
R5	Resistor	470	ELR25
R6	Resistor	220	ELR25
R7	Resistor	47	R25
R8	Resistor	47	ELR25
R9	Resistor	100	R20
R10	Resistor	15k	ELR25
R11	Resistor	1k	R25
R12	Resistor	470	R20
R13	Resistor	1.2k	ELR20
R14	Resistor	220	ELR25
R15	Resistor	47k	ELR25
R17	Resistor	10k	ELR25
R18	Resistor	220	ELR25
R19	Resistor	22k	ELR25
R20	Resistor	100	ELR25
R21	Resistor	8.2k	ELR25
R22	Resistor	1k	ELR25
R24	Resistor	100	ELR25
R25	Resistor	100	R20
R26	Resistor	470	ELR25
R27	Resistor	220	ELR25
R28	Resistor	100	ELR25
R29	Resistor	3.3	ELR25
R30	Resistor	1.5k	ELR25
R31	Resistor	22k	ELR25
R32	Resistor	10k	ELR25
R33	Resistor	10k	ELR25
R34	Resistor	220	ELR25
R35	Resistor	220	ELR25
R37	Resistor	2.7k	ELR25
R38	Resistor	390	ELR25
R39	Resistor	1k	ELR25
R40	Resistor	4.7k	ELR25
R41	Resistor	1.8M	ELR25
R42	Resistor	1k	ELR25
R43	Trimmer	RHB0CS21LA 470B	
R44	Resistor	4.7k	ELR25
R45	Resistor	1k	R25
R46	Resistor	4.7k	R25
R47	Resistor	100	R25
R48	Resistor	2.2k	ELR25
R49	Resistor	2.2k	ELR25
R50	Resistor	10k	ELR25
R52	Resistor	27k	ELR25
R53	Resistor	22k	ELR25
R54	Resistor	22k	ELR25
R55	Resistor	47k	ELR25
R56	Resistor	100k	ELR25
R57	Resistor	100k	ELR25
R58	Resistor	150	ELR25
R59	Resistor	3.3k	ELR25
R60	Resistor	100k	ELR25
R61	Resistor	100k	ELR25
R62	Resistor	150	ELR25
R63	Resistor	3.3k	ELR25
R64	Resistor	100k	ELR25
R65	Resistor	100k	ELR25
R66	Resistor	150	ELR25

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.	
R67	Resistor	3.3k	ELR25
R68	Resistor	100k	ELR25
R69	Resistor	100k	ELR25
R70	Resistor	150	ELR25
R71	Resistor	3.3k	ELR25
R72	Resistor	180	ELR25
R73	Resistor	33	ELR25
R74	Resistor	4.7k	ELR25
R75	Resistor	220	ELR25
R76	Resistor	330	ELR25
R77	Resistor	22	ELR25
R78	Resistor	220	ELR25
R79	Resistor	22k	ELR25
R80	Resistor	100	ELR25
R81	Resistor	560	ELR25
R82	Resistor	10k	ELR25
R83	Resistor	47k	ELR25
R84	Resistor	10k	ELR25
R85	Resistor	220	ELR25
R86	Resistor	10k	ELR25
R87	Resistor	100	ELR25
R88	Resistor	100	R25
R89	Resistor	220	ELR25
R90	Resistor	22k	ELR25
R91	Resistor	10k	ELR25
R92	Resistor	470	ELR25
R93	Resistor	47	ELR25
R94	Resistor	10k	R25
R95	Resistor	10k	R25
R96	Resistor	10k	R25
R97	Resistor	10k	R25
R98	Resistor	47k	R25
R99	Resistor	47k	R25
R100	Resistor	SRW1P10-J	
R101	Resistor	120	R50X
R102	Resistor	220	ELR25
R103	Resistor	47	ELR25
R104	Resistor	22	ELR20
R105	Resistor	1k	R25
R106	Resistor	15k	R25
R107	Resistor	100	ELR25
R108	Resistor	47	ELR25
R109	Resistor	3.3k	R20
R110	Resistor	820	R20
R201	Resistor	10k	R20
R202	Resistor	1k	R25
R203	Resistor	2.7k	ELR20
R204	Resistor	33k	ELR25
R205	Resistor	10k	ELR25
R206	Resistor	470k	R20
R208	Resistor	180	ELR25
R209	Resistor	150	ELR25
R210	Resistor	5.6k	ELR25
R211	Resistor	1.2k	ELR25
R212	Resistor	330	ELR25
R213	Resistor	150	R25
R214	Resistor	4.7k	R25
R215	Resistor	2.2k	R25
R216	Resistor	2.7k	ELR25
R217	Resistor	2.7k	ELR25
R218	Resistor	390	ELR25

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
C2	Ceramic	0.0047 50V
C3	Ceramic	10P 50V CH
C4	Ceramic	0.0047 50V
C5	Electrolytic	10 16V
C6	Ceramic	82P 50V TH
C7	Ceramic	0.0047 50V
C8	Ceramic	82P 50V TH
C9	Ceramic	10P 50V
C10	Ceramic	68P 50V
C11	Ceramic	47P 50V
C12	Ceramic	100P 50V
C13	Ceramic	100P 50V
C14	Barrier Layer	0.047 25V
C15	Ceramic	22P 50V
C16	Barrier Layer	0.047 25V
C19	Ceramic	0.001 50V
C20	Ceramic	0.001 50V
C21	Ceramic	0.0047 50V
C22	Ceramic	8P 50V
C23	Ceramic	1P 50V
C24	Ceramic	8P 50V
C25	Ceramic	1P 50V
C26	Ceramic	8P 50V
C27	Barrier Layer	0.047 25V
C29	Ceramic	470P 50V
C30	Ceramic	470P 50V
C31	Barrier Layer	0.1 16V
C32	Ceramic	0.0047 50V
C33	Electrolytic	47 10V
C34	Ceramic	0.0047 50V
C35	Ceramic	6P 50V
C36	Ceramic	6P 50V
C37	Ceramic	0.0047 50V
C39	Ceramic	33P 50V
C40	Ceramic	0.0047 50V
C41	Ceramic	0.001 50V
C42	Ceramic	0.0047 50V
C43	Ceramic	43P 50V
C44	Ceramic	51P 50V
C45	Ceramic	120P 50V
C46	Ceramic	22P 50V
C47	Ceramic	100P 50V
C48	Ceramic	150P 50V
C49	Ceramic	82P 50V
C50	Ceramic	56P 50V
C51	Ceramic	330P 50V
C52	Ceramic	68P 50V
C53	Ceramic	150P 50V
C54	Ceramic	0.0047 50V
C55	Ceramic	0.0047 50V
C56	Ceramic	0.001 50V
C57	Ceramic	0.0047 50V
C58	Ceramic	0.0022 50V
C59	Ceramic	0.0047 50V
C60	Ceramic	0.0047 50V
C62	Ceramic	0.0047 50V
C63	Ceramic	0.0047 50V
C64	Electrolytic	47 10V
C65	Array	B7ZC0717-32N 470Px6
C66	Electrolytic	47 10V
C67	Barrier Layer	0.047 25V
C68	Barrier Layer	0.1 16V

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
C69	Ceramic	0.001 50V
C70	Ceramic	0.001 50V
C71	Electrolytic	1 50V
C72	Electrolytic	100 10V
C73	Ceramic	0.0047 50V
C74	Barrier Layer	0.047 25V
C75	Electrolytic	0.47 50V BP
C76	Ceramic	56P 50V
C77	Ceramic	24P 50V
C78	Trimmer	VCT51C143A 10P
C79	Ceramic	56P 50V CH
C80	Ceramic	12P 50V CH
C81	Ceramic	12P 50V CH
C82	Ceramic	0.0047 50V
C83	Ceramic	1P 50V
C84	Ceramic	0.0047 50V
C85	Barrier Layer	0.047 25V
C86	Ceramic	56P 50V
C87	Ceramic	15P 50V
C88	Trimmer	VCT51C143A 10P
C89	Ceramic	47P 50V CH
C90	Ceramic	12P 50V CH
C91	Ceramic	12P 50V CH
C92	Ceramic	0.0047 50V
C93	Ceramic	1P 50V
C94	Ceramic	0.0047 50V
C95	Ceramic	47P 50V
C96	Ceramic	10P 50V
C97	Trimmer	VCT51A123A 6P
C98	Ceramic	47P 50V CH
C99	Ceramic	12P 50V CH
C100	Ceramic	8P 50V CH
C101	Ceramic	0.0047 50V
C102	Ceramic	1P 50V
C103	Ceramic	0.0047 50V
C104	Barrier Layer	0.047 25V
C105	Ceramic	39P 50V
C106	Ceramic	7P 50V
C107	Trimmer	VCT51A123A 6P
C108	Ceramic	33P 50V CH
C109	Ceramic	12P 50V CH
C110	Ceramic	5P 50V CH
C111	Ceramic	0.0047 50V
C112	Ceramic	1P 50V
C113	Ceramic	0.0047 50V
C114	Barrier Layer	0.047 25V
C115	Electrolytic	100 10V
C116	Ceramic	0.0047 50V
C117	Ceramic	22P 50V
C118	Ceramic	47P 50V
C119	Ceramic	47P 50V
C120	Ceramic	0.0047 50V
C121	Ceramic	0.0047 50V
C122	Ceramic	0.001 50V
C123	Ceramic	0.0047 50V
C124	Ceramic	22P 50V
C126	Ceramic	0.0047 50V
C127	Ceramic	47P 50V
C128	Electrolytic	47 10V
C129	Electrolytic	100 16V
C130	Ceramic	0.0047 50V
C131	Ceramic	0.0047 50V

PLL UNIT

REF. NO.	DESCRIPTION	PART NO.
C132	Electrolytic	47 10V
C133	Ceramic	0.001 50V
C134	Ceramic	0.001 50V
C135	Ceramic	0.001 50V
C136	Ceramic	0.001 50V
C137	Electrolytic	10 16V
C139	Ceramic	0.0047 50V
C140	Ceramic	0.0047 50V
C141	Barrier Layer	0.1 16V
C145	Ceramic	0.0047 50V
C147	Ceramic	5P 50V
C148	Ceramic	33P 50V
C150	Ceramic	0.0047 50V
C151	Ceramic	0.0047 50V
C152	Ceramic	0.001 50V
C153	Electrolytic	10 16V MS7
C154	Ceramic	10P 50V
C155	Ceramic	120P 50V
C156	Ceramic	0.0047 50V
C201	Array	B7ZC0717-32N 470Px6
C202	Electrolytic	0.22 50V RC2
C203	Barrier Layer	0.047 25V
C204	Ceramic	0.0022 50V
C205	Ceramic	0.001 50V
C206	Electrolytic	47 10V
C207	Ceramic	39P 50V UJ
C208	Ceramic	22P 50V
C209	Ceramic	4P 50V
C210	Ceramic	4P 50V
C211	Electrolytic	47 10V
C212	Ceramic	0.0022 50V
C213	Ceramic	1P 50V
C214	Ceramic	0.0047 50V
C215	Ceramic	0.001 50V
C216	Ceramic	47P 50V
C217	Ceramic	0.0022 50V
C218	Ceramic	0.0047 50V
C219	Barrier Layer	0.047 25V
C220	Ceramic	470P 50V
C221	Ceramic	0.0047 50V
C222	Ceramic	0.001 50V
C223	Electrolytic	47 10V
C224	Ceramic	0.0047 50V
C225	Ceramic	0.0047 50V
C226	Ceramic	0.0047 50V
C227	Ceramic	0.0047 50V
J1	Connector	TL25P-06-V1
J2	Connector	5138-11CPB
J3	Connector	5138-04CPB
J4	Connector	TMP-J01X-V2
J5	Connector	TMP-J01X-V2
P1	Connector	TL25H-02-B1
EP1	P.C.Board	B-704F
EP2	Ferrite Bead	DL2-OP-2.6-3-1.2H
W1	Jumper	23/01/230/D21/D21
W2	Jumper	23/02/165/D21/D21
W3	Jumper	23/03/105/D21/D21
W4	Jumper	23/04/165/D21/D21

PLL UNIT/MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
W5	Jumper	23/05/170/D21/D21
W6	Jumper	23/06/135/D21/D21
W7	Jumper	[61/99/125/W13A/W13A 08 A A]
W8	Jumper	
W9	Jumper	[61/99/140/W13A/W13A 08 A A]
W10	Jumper	
W11	Jumper	23/07/110/D21/D21
W12	Jumper	[62/99/350/C01/W13A 08 A A]
W13	Jumper	
W14	Jumper	IPS-1041-4
W16	Jumper	IPS-1041-4
W17	Jumper	IPS-1041-4
W18	Jumper	IPS-1041-4
W20	Jumper	IPS-1041-4
W21	Jumper	IPS-1041-2
W24	Jumper	IPS-1041-4
W25	Jumper	IPS-1041-4
W26	Jumper	IPS-1041-4
W27	Jumper	IPS-1041-4
W28	Jumper	IPS-1041-4
W29	Jumper	IPS-1041-4
W30	Jumper	IPS-1041-4
W31	Jumper	IPS-1041-4
W32	Jumper	IPS-1041-4
W33	Jumper	IPS-1041-4
W34	Jumper	JPW-02A
W36	Jumper	IPS-1041-4

10 - 7 MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μPD4069UBC
IC2	IC	NJM4558D
IC3	IC	μPD4051BC
IC4	IC	NJM4558D
IC5	IC	NJM4558D
IC6	IC	NJM4558D
IC7	IC	NJM4558D
IC8	IC	μPD4066BC
IC9	IC	μPC1037H
IC10	IC	μPC1037H
IC11	IC	μPC1037H
IC12	IC	BA401
IC13	IC	μPC577H
IC14	IC	NJM4558D
IC15	IC	μPC1037H
IC16	IC	NJM4558D
IC17	IC	μA7808
IC18	IC	μPC1241H
IC19	IC	NJM4558D
IC20	IC	μPC1037H
Q1	FET	3SK74-M
Q2	FET	2SK241-Y
Q3	Transistor	2SC2785-FF
Q4	Transistor	2SC3402
Q5	Transistor	2SC3402
Q6	Transistor	2SC2458-GR
Q7	Transistor	2SC2458-GR
Q8	FET	3SK74-M

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
Q9	Transistor	2SC1583-G
Q10	Transistor	2SC2785-FF
Q11	Transistor	2SC2458-GR
Q12	Transistor	2SC2878
Q13	Transistor	2SA1048-GR
Q15	Transistor	2SC2878
Q16	Transistor	2SA1348
Q17	Transistor	2SC2878
Q20	Transistor	2SC3402
Q21	Transistor	2SC3402
Q22	Transistor	2SC2458-GR
Q23	Transistor	2SC2458-GR
Q24	Transistor	2SA1348
Q25	Transistor	2SC3402
Q26	Transistor	2SA1048-GR
Q27	Transistor	2SA1048-GR
Q28	Transistor	2SA1048-GR
Q29	Transistor	2SC3399
Q30	Transistor	2SA1348
Q31	Transistor	2SC3399
Q32	Transistor	2SC2458-GR
Q33	FET	3SK74-M
Q34	Transistor	2SC1571-G
Q35	Transistor	2SC2458-GR
Q36	Transistor	2SC2785-FF
Q37	Transistor	2SC2458-Y/GR
Q38	Transistor	2SC2785-FF
Q39	FET	3SK74-M
Q40	Transistor	2SC3399
Q41	Transistor	2SC3402
Q42	Transistor	2SC2785-FF
Q43	FET	3SK74-M
Q44	FET	3SK74-M
Q45	Transistor	2SC2785-FF
Q46	Transistor	2SC2458-Y/GR
Q47	Transistor	2SC2785-FF
Q48	Transistor	2SC3402
Q49	FET	2SK241-Y
Q50	Transistor	2SC2785-FF
Q51	Transistor	2SC2785-FF
Q52	Transistor	2SC3402
Q53	Transistor	2SC3402
Q54	Transistor	2SC2785-FF
Q55	Transistor	2SC2785-FF
Q56	Transistor	2SC3402
Q57	Transistor	2SC3402
Q58	Transistor	2SA1048-Y/GR
Q59	Transistor	2SC2878
Q60	Transistor	2SC2458-Y
Q61	Transistor	2SA1048-GR
Q62	Transistor	2SC2458-Y/GR
Q63	Transistor	2SD468-C
Q64	Transistor	2SC2458-GR
Q65	Transistor	2SC2458-GR
Q66	Transistor	2SD468-C
Q67	Transistor	2SC2458-GR
Q68	Transistor	2SD880-Y
Q69	Transistor	2SC3402
Q70	Transistor	2SC2458-GR
Q71	Transistor	2SC3399
Q72	Transistor	2SC2785-FF
Q74	Transistor	2SC3402

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
Q75	Transistor	2SC3402
Q76	Transistor	2SC2458-GR
Q77	Transistor	2SC3399
Q78	Transistor	2SC2458-GR
Q79	Transistor	2SC2458-GR
Q80	Transistor	2SC2785-FF
Q81	Transistor	2SC3402
Q82	Transistor	2SA1048-Y/GR
Q83	Transistor	2SC3399
Q84	Transistor	2SC2785-FF
D1	Diode	1SS216
D2	Diode	1SS53
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1SS53
D6	Diode	1SS53
D7	Diode	1SS53
D8	Diode	1SS53
D9	Diode	1SS53
D10	Diode	1SS53
D11	Diode	1SS53
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Zener	MZ304 B
D17	Diode	1K60
D18	Diode	1K60
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1SS53
D23	Diode	1SS53
D24	Diode	1SS133
D25	Diode	1SS53
D26	Diode	1SS53
D27	Diode	1SS53
D28	Diode	1SS133
D29	Diode	1SS133
D30	Diode	1SS133
D31	Diode	1SS133
D32	Diode	1SS133
D33	Diode	1SS133
D34	Diode	1SS133
D35	Diode	1SS133
D36	Diode	1SS53
D37	Diode	1SS133
D38	Diode	1SS53
D39	Diode	1SS53
D40	Diode	1SS133
D41	Diode	1SS133
D42	Diode	1SS133
D43	Diode	1SS133
D44	Diode	1SS53
D45	Diode	1SS53
D46	Diode	1SS53
D47	Diode	1SS53
D49	Diode	1SS53
D50	Diode	1SS53
D51	Diode	1SS53
D52	Diode	1SS53

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
D53	Diode	1SS53
D54	Diode	1SS53
D55	Diode	1K60
D56	Diode	1K60
D57	Diode	1SS53
D58	Diode	1S953
D59	Diode	1SS53
D60	Diode	1SS53
D63	Diode	1SS53
D64	Diode	1SS53
D66	Diode	1SS53
D67	Diode	1SS216
D68	Diode	1SS216
D69	Diode	1SS216
D70	Diode	1SS216
D71	Diode	1SS216
D72	Diode	1SS53
D73	Diode	1SS53
D74	Diode	1SS53
D75	Diode	1SS53
D76	Diode	1SS53
D77	Diode	1SS53
D78	Diode	1SS53
D79	Diode	1SS53
D80	Diode	1SS53
D81	Diode	1SS53
D82	Diode	1SS53
D83	Diode	1SS53
D84	Diode	1SS53
D85	Diode	1SS53
D86	Diode	1SS53
D87	Diode	1SS53
D88	Diode	1SS53
D89	Diode	1SS216
D90	Diode	1SS53
D91	Diode	1SS53
D92	Diode	1SS211
D93	Diode	1SS211
D94	Diode	1SS53
D95	Diode	1K60
D96	Diode	1SS53
D97	Diode	1SS53
D98	Diode	1SS216
D99	Diode	1SS216
D100	Diode	1SS216
D101	Diode	1SS216
D102	Diode	1SS53
D103	Diode	1SS216
D104	Diode	1SS216
D105	Diode	1SS216
D106	Diode	1SS216
D107	Diode	1SS53
D108	Diode	1SS53
D109	Diode	1SS53
D110	Varicap	FC51M
D111	Varicap	1SV50E
D112	Diode	1SS99
D114	Diode	1SS53
D115	Diode	1SS53
D116	Diode	1K60
D117	Diode	1K60
D118	Varicap	1SV50E

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
D119	Diode	1SS53
D120	Diode	1SS216
D121	Diode	1SS53
D122	Diode	1SS53
D123	Diode	1SS53
D124	Diode	1SS216
D125	Diode	1SS216
D126	Varicap	1SV50E
D127	Diode	1SS53
D128	Diode	1SS53
D129	Diode	1SS53
D130	Diode	1SS53
D131	Diode	1SS53
D133	Diode	1SS53
D134	Diode	1SS53
D135	Diode	1SS53
D136	Diode	1SS53
D137	Diode	1SS53
D138	Diode	1SS53
D139	Diode	1SS53
D140	Diode	1SS53
D141	Diode	1SS211
D142	Diode	1SS53
D143	Diode	1SS53
D144	Diode	1SS53
D145	Diode	1K60
D147	Diode	1SS53
D148	Diode	1SS53
D149	Diode	1SS53
D150	Diode	1SS53
D151	Diode	1SS53
D152	Diode	1SS53
D155	Diode	1SS133
D157	Diode	1SS99
D158	Diode	1SS99
D159	Diode	1SS53
FI1	Monolithic	FL-87
FI2	Monolithic	FL-80
FI3	Crystal	FL-44A
FI4	Ceramic	CFJ-455K5
FI5	Ceramic	CFW-455HT
FI6	Ceramic	CFW-455E
FI7	Monolithic	FL-23
FI8	Monolithic	FL-32A
X1	Crystal	CR-168
X2	Crystal	CR-168
X3	Discriminator	CFY-455S
X4	Crystal	HC12/U 9.0105MHz
X5	Crystal	CR-168
X6	Crystal	CR-169
X7	Crystal	CR-1
L1	Coil	LS-163
L2	Coil	LS-163
L3	Coil	LAL03NA 101K
L4	Coil	LS-175
L5	Coil	LS-175
L6	Coil	LS-175
L7	Coil	FL5H 101K
L9	Coil	FL5H 102K

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
L10	Coil	LS-163
L11	Coil	LS-90A
L12	Coil	LS-90A
L13	Coil	LAL03NA 100K
L14	Coil	LAL03NA 100K
L16	Coil	LS-146
L17	Coil	LAL04NA 101K
L18	Coil	LS-146
L19	Coil	S4 101K
L20	Coil	S4 101K
L21	Coil	LAL03NA 101K
L22	Coil	LS-175
L23	Coil	LS-282
L24	Coil	LS-175
L25	Coil	LS-175
L26	Coil	LS-266
L27	Coil	LS-122
L28	Coil	LS-16
L29	Coil	LS-133
L30	Coil	LAL03NA 150K
L31	Coil	LAL03NA 100K
L32	Coil	LAL03NA 101K
L33	Coil	LS-93A
L34	Coil	LS-93A
L35	Coil	LS-93A
L36	Coil	LS-292
L37	Coil	BT01RN1-A61
L39	Coil	LW-15
L40	Coil	LAL04NA 101K
L41	Coil	LAL03NA 101K
L42	Coil	LAL03NA 101K
L43	Coil	LAL04NA 102K
L44	Coil	LAL04NA 102K
L45	Coil	LAL03NA 101K
L46	Coil	LW-15
L47	Coil	LAL03NA 3R3K
L48	Coil	LAL03NA 101K
L49	Coil	LAL04NA 101K
L50	Coil	FL5H 101K
L51	Coil	LAL03NA 101K
L52	Coil	LAL03NA 390K
L53	Coil	LAL03NA 101K
R1	Resistor	4.7k ELR25
R2	Resistor	220 ELR25
R3	Resistor	220 ELR25
R4	Resistor	47 R20
R5	Resistor	10k ELR25
R6	Resistor	10k ELR25
R7	Resistor	10k ELR25
R8	Resistor	3.9k ELR25
R9	Resistor	3.9k ELR25
R11	Resistor	47k ELR25
R13	Resistor	560 R25
R14	Resistor	3.3k ELR20
R15	Resistor	33k ELR25
R16	Resistor	47k R20
R17	Resistor	10k R20
R18	Resistor	10k R20
R19	Resistor	4.7k R20
R20	Resistor	47k ELR25
R21	Resistor	10k ELR25

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
R22	Resistor	4.7k ELR25
R23	Resistor	4.7k ELR25
R24	Resistor	33k ELR25
R25	Resistor	15k ELR25
R26	Resistor	4.7k ELR20
R27	Resistor	33k ELR25
R28	Resistor	15k ELR25
R29	Resistor	5.6k ELR25
R31	Resistor	82k ELR20
R32	Resistor	180k ELR20
R34	Resistor	47 ELR25
R35	Resistor	100k ELR25
R36	Resistor	470 ELR25
R37	Resistor	1M ELR25
R38	Resistor	220 ELR25
R39	Resistor	22k R25
R40	Resistor	1k ELR25
R41	Resistor	150 ELR25
R42	Resistor	100k ELR20
R43	Resistor	100k ELR20
R44	Resistor	1k ELR25
R45	Resistor	150 ELR25
R46	Resistor	6.8k ELR25
R47	Resistor	68k R20
R48	Resistor	47k ELR25
R49	Resistor	56k ELR25
R50	Resistor	100 ELR25
R51	Resistor	2.2k ELR25
R52	Resistor	2.2k ELR25
R53	Resistor	5.6k ELR25
R54	Resistor	1.5k R25
R55	Resistor	68k ELR25
R56	Resistor	470 ELR25
R57	Resistor	10k ELR25
R58	Resistor	10k ELR25
R59	Resistor	10k ELR25
R60	Resistor	22k ELR25
R61	Resistor	6.8k ELR25
R62	Array	RMX-5 47K
R63	Resistor	22k ELR25
R65	Resistor	27k ELR25
R66	Resistor	100 ELR25
R68	Trimmer	RHB0CS42BA 47k
R69	Resistor	3.3M ELR25
R70	Resistor	1M ELR25
R71	Resistor	1M ELR25
R72	Resistor	150 ELR25
R73	Resistor	47k ELR25
R74	Resistor	22k ELR25
R75	Resistor	3.3k ELR25
R76	Resistor	56k ELR25
R77	Resistor	150 ELR25
R78	Resistor	1.8M ELR25
R79	Resistor	680k ELR25
R80	Resistor	220k ELR25
R81	Resistor	390 ELR20
R82	Resistor	56k ELR25
R83	Resistor	150k R20
R84	Trimmer	RHB0CJ401A 22k
R85	Resistor	150k ELR25
R86	Resistor	220k ELR25
R87	Trimmer	RHB0CS42BA 47k

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
R88	Resistor	15k R20
R89	Resistor	470k ELR25
R90	Resistor	22 ELR25
R91	Trimmer	RHB0CS42BA 47k
R92	Resistor	150k ELR25
R93	Resistor	220k R20
R94	Resistor	470k ELR25
R95	Trimmer	RHB0C1431A 10k
R96	Trimmer	RHB0C1431A 10k
R97	Resistor	1k ELR25
R98	Trimmer	RHB0C1431A 10k
R99	Trimmer	RHB0C1431A 10k
R100	Resistor	1M ELR20
R101	Resistor	56k ELR25
R102	Resistor	22k ELR25
R103	Trimmer	RHB0CJ30EA 2.2k
R104	Resistor	22k ELR25
R105	Resistor	56k R20
R106	Trimmer	RHB0C1324A 1k
R107	Resistor	27k ELR20
R108	Resistor	5.6k ELR20
R109	Resistor	470 ELR25
R110	Resistor	22k ELR25
R111	Resistor	4.7k ELR25
R112	Resistor	1k ELR25
R113	Resistor	4.7k ELR25
R114	Resistor	150 R20
R115	Resistor	10k R20
R116	Resistor	4.7k ELR25
R117	Resistor	220k ELR25
R118	Resistor	47k ELR25
R119	Resistor	3.3k R25
R120	Resistor	15k ELR25
R121	Trimmer	RHB0CN40YA 33k
R122	Resistor	180k ELR25
R123	Resistor	100k R25
R124	Resistor	120k ELR20
R125	Trimmer	RH0521C15J05A 100k
R126	Resistor	100k R20
R127	Resistor	5.6k ELR25
R128	Resistor	39k ELR25
R129	Resistor	100 ELR25
R130	Resistor	3.9k ELR25
R131	Resistor	330 ELR25
R132	Resistor	1M ELR25
R133	Resistor	1M ELR25
R134	Resistor	1k ELR25
R135	Resistor	100k ELR25
R136	Resistor	1k ELR25
R137	Resistor	4.7k ELR25
R138	Resistor	22k R20
R139	Resistor	4.7k ELR25
R140	Resistor	2.2k ELR25
R141	Resistor	2.2k ELR20
R142	Resistor	1k ELR25
R143	Resistor	4.7k ELR25
R144	Resistor	330 ELR25
R145	Resistor	47 ELR25
R146	Resistor	56k ELR25
R147	Resistor	220 ELR25
R148	Resistor	1k ELR25
R149	Resistor	100 ELR25

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
R150	Resistor	39k ELR25
R151	Resistor	2.2k ELR20
R152	Resistor	47k ELR20
R153	Resistor	2.7k R20
R154	Resistor	1.5k ELR25
R155	Trimmer	RHA3A140SA 10k
R156	Resistor	2.2k R20
R157	Resistor	330k ELR25
R158	Trimmer	RHB0C1431A 10k
R159	Trimmer	RHB0C1431A 10k
R160	Resistor	100k ELR25
R161	Trimmer	RHB0C1431A 10k
R162	Resistor	2.2k ELR25
R163	Resistor	100 ELR25
R164	Resistor	5.6k ELR20
R165	Resistor	5.6k ELR25
R166	Resistor	5.6k ELR20
R167	Resistor	220 R20
R168	Resistor	1k R25
R169	Resitor	1.5k R20
R170	Resistor	5.6k R20
R171	Resistor	1.5k R25
R172	Resistor	220 R20
R173	Resistor	1.5k R20
R174	Resistor	100 R25
R175	Resistor	5.6k R20
R176	Resistor	1.2k R20
R177	Resistor	220 R20
R178	Resistor	100 R25
R179	Resistor	1.5k R20
R180	Resistor	100 R25
R181	Resistor	5.6k R20
R182	Resistor	1.2k R20
R183	Resistor	4.7k ELR25
R184	Resistor	4.7k ELR25
R185	Resistor	5.6k ELR25
R186	Resistor	2.7k ELR25
R187	Resistor	2.2k ELR25
R188	Resistor	1.2k ELR25
R189	Resistor	47k ELR25
R190	Resistor	10k ELR25
R191	Resistor	330 ELR25
R192	Resistor	56 ELR25
R193	Resistor	100 ELR25
R194	Resistor	47 ELR25
R195	Resistor	6.8k ELR25
R196	Trimmer	RHB0CJ401A 22k
R197	Resistor	18k ELR25
R198	Resistor	22k ELR25
R199	Resistor	10k ELR25
R200	Resistor	1k ELR25
R201	Resistor	100 R25
R202	Resistor	4.7k ELR25
R203	Resistor	4.7k ELR25
R204	Resistor	220k ELR25
R205	Resistor	47 ELR25
R206	Resistor	6.8k ELR25
R207	Thermistor	112 503-2AI
R208	Resistor	10k ELR25
R209	Resistor	10k ELR25
R210	Resistor	330 ELR25

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.	
R211	Resistor	10k	ELR20
R212	Resistor	220	ELR25
R213	Resistor	4.7k	R25
R214	Resistor	6.8k	R20
R215	Resistor	6.8k	R25
R216	Resistor	220	R25
R217	Resistor	47k	ELR25
R218	Resistor	6.8k	R25
R219	Resistor	100	R25
R220	Resistor	6.8k	ELR25
R221	Resistor	220	R25
R222	Resistor	47k	ELR25
R223	Resistor	6.8k	R20
R224	Resistor	100	R25
R225	Resistor	6.8k	ELR25
R226	Resistor	220	R25
R227	Resistor	47k	ELR25
R228	Resistor	6.8k	ELR25
R229	Resistor	100	R25
R230	Resistor	6.8k	R25
R231	Resistor	220	R25
R232	Resistor	47k	ELR25
R233	Resistor	6.8k	R20
R234	Resistor	100	R25
R235	Resistor	3.9k	ELR25
R236	Resistor	220	ELR25
R237	Resistor	3.9k	ELR25
R238	Resistor	1k	ELR25
R239	Trimmer	RHB0C1431A 10k	
R240	Resistor	220k	ELR25
R241	Resistor	2.2k	ELR25
R242	Resistor	4.7k	ELR25
R243	Resistor	4.7k	ELR25
R244	Resistor	10k	ELR25
R245	Resistor	2.2k	ELR25
R246	Resistor	100k	ELR25
R247	Resistor	56k	ELR25
R248	Resistor	22k	ELR20
R249	Resistor	3.3k	ELR20
R250	Resistor	100k	ELR20
R251	Resistor	220	ELR25
R252	Resistor	3.9k	ELR25
R253	Resistor	47	ELR25
R254	Resistor	100	ELR25
R255	Resistor	330	ELR25
R256	Resistor	220	ELR25
R257	Thermistor	35D45	
R258	Resistor	6.8k	ELR25
R259	Trimmer	RHB0C1431A 10k	
R260	Resistor	100	ELR25
R261	Resistor	47	ELR25
R262	Resistor	330	ELR25
R263	Resistor	100	R25
R264	Resistor	2.2k	ELR25
R265	Resistor	150	ELR25
R266	Resistor	1k	ELR25
R267	Resistor	10k	ELR25
R268	Resistor	1k	ELR25
R269	Resistor	15k	ELR25
R270	Trimmer	RHB0C1324A 1k	
R271	Resistor	2.2k	ELR25
R272	Resistor	220	ELR20

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.	
R273	Resistor	3.3k	ELR25
R274	Resistor	100	R20
R275	Resistor	100	R20
R276	Resistor	10k	ELR25
R277	Resistor	10k	ELR25
R278	Resistor	1k	ELR25
R279	Resistor	2.7k	ELR25
R280	Resistor	12k	ELR20
R281	Resistor	3.3M	ELR25
R282	Resistor	10k	ELR25
R283	Resistor	1k	ELR25
R284	Resistor	5.6k	R25
R285	Resistor	82k	ELR25
R286	Resistor	82k	ELR25
R287	Resistor	82k	ELR25
R288	Resistor	330k	ELR20
R289	Resistor	220	ELR20
R290	Trimmer	RHB0CS32UA 4.7k	
R291	Resistor	220	R25
R292	Trimmer	RHB0CS32UA 4.7k	
R293	Resistor	18k	ELR25
R294	Resistor	22k	ELR25
R295	Resistor	470k	ELR25
R296	Resistor	47k	ELR25
R297	Thermistor	33D28	
R298	Resistor	33k	ELR25
R299	Resistor	3.9k	ELR25
R300	Resistor	5.6k	ELR25
R301	Resistor	22k	ELR25
R302	Resistor	22k	ELR25
R303	Resistor	220	ELR25
R304	Resistor	560	ELR25
R305	Resistor	47k	R20
R306	Resistor	220	ELR25
R307	Resistor	220	ELR25
R308	Resistor	150	R20
R309	Resistor	1k	R20
R310	Resistor	22k	ELR25
R311	Resistor	47k	ELR25
R312	Resistor	150	R20
R313	Resistor	2.2k	R20
R314	Resistor	22k	R20
R315	Resistor	22k	R20
R316	Resistor	10k	R20
R317	Resistor	2.2k	R20
R318	Resistor	2.2k	R20
R319	Resistor	2.2k	R20
R320	Resistor	2.2k	R20
R321	Resistor	2.2k	R20
R322	Resistor	2.2k	R25
R323	Resistor	47k	ELR25
R324	Resistor	47k	ELR25
R325	Resistor	150	R20
R326	Resistor	150	R20
R327	Resistor	33k	ELR25
R328	Resistor	2.2k	ELR25
R329	Resistor	22k	ELR25
R330	Resistor	10k	R20
R331	Resistor	47k	R20
R332	Resistor	100k	R20
R333	Resistor	22k	ELR25
R334	Resistor	100k	R20

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
R335	Resistor	3.3M ELR25
R336	Resistor	100k ELR25
R337	Trimmer	RHB0C1431A 10k
R338	Resistor	22k ELR25
R339	Resistor	680 ELR25
R340	Resistor	4.7k ELR20
R341	Resistor	1k ELR25
R342	Resistor	22k ELR25
R343	Resistor	150k ELR25
R344	Resistor	1.5k ELR25
R345	Resistor	5.6k ELR25
R346	Resistor	33k ELR25
R347	Resistor	150 ELR25
R348	Resistor	33k ELR25
R349	Resistor	5.6k ELR25
R350	Resistor	33k ELR25
R351	Resistor	10k ELR25
R352	Resistor	10k ELR25
R353	Resistor	82k ELR25
R354	Resistor	22 ELR25
R355	Resistor	82k ELR25
R356	Resistor	270k ELR25
R357	Resistor	1k ELR25
R358	Resistor	22k ELR25
R359	Resistor	47k ELR25
R360	Resistor	4.7k ELR25
R361	Resistor	4.7k ELR25
R362	Resistor	10k ELR25
R363	Resistor	10 ELR25
R364	Resistor	1k R25
R365	Resistor	1.5k ELR25
R366	Resistor	10k ELR25
R367	Resistor	5.6 ELR25
R368	Resistor	1k ELR25
R369	Resistor	4.7k ELR25
R371	Resistor	1k ELR25
R372	Resistor	1 ELR25
R373	Resistor	100 ELR25
R374	Trimmer	RHB0CS32UA 4.7k
R375	Resistor	3.3k ELR25
R376	Resistor	6.8k ELR25
R377	Resistor	4.7k ELR25
R378	Resistor	18k ELR25
R379	Resistor	390 ELR25
R380	Resistor	1k ELR25
R381	Resistor	330 ELR25
R382	Resistor	10k ELR25
R383	Resistor	33k ELR25
R384	Resistor	560 R25
R385	Resistor	1k ELR25
R386	Resistor	3.9k ELR25
R388	Resistor	10k ELR20
R389	Resistor	10k ELR20
R390	Resistor	2.2k ELR25
R391	Resistor	5.6k ELR25
R392	Resistor	10k ELR25
R393	Resistor	10k ELR20
R394	Resistor	3.3k ELR20
R395	Resistor	5.6k ELR25
R396	Resistor	100k ELR25
R397	Resistor	100k ELR25

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
R398	Resistor	10k R25
R399	Resistor	1.5k ELR25
R400	Resistor	1.2k ELR25
R401	Resistor	22k R25
R402	Resistor	4.7k ELR25
R403	Resistor	100 ELR25
R404	Resistor	47k ELR25
R405	Resistor	4.7k R25
R406	Resistor	47k ELR25
R407	Resistor	100 ELR25
R408	Resistor	10k ELR25
R409	Resistor	220 ELR25
R410	Resistor	22k ELR25
R411	Resistor	22k ELR25
R412	Resistor	1.5k ELR25
R413	Resistor	330 ELR25
R414	Resistor	680 ELR25
R415	Resistor	1.5k ELR25
R416	Resistor	220k ELR25
R418	Resistor	82k ELR25
R419	Resistor	10k ELR25
R420	Resistor	5.6k R20
R421	Resistor	3.9k R20
R422	Resistor	10k R20
R423	Resistor	5.6k R20
R424	Resistor	2.2k ELR25
R425	Resistor	220 ELR25
R426	Resistor	1k ELR25
R427	Resistor	220 ELR20
R428	Resistor	150 R25
R429	Resistor	47 ELR25
R430	Resistor	1.5k R20
R431	Resistor	2.2k ELR20
R432	Resistor	2.7k R20
R433	Resistor	2.7k R20
R434	Resistor	150k ELR20
R435	Resistor	2.7k ELR20
R436	Resistor	12k ELR20
R438	Resistor	1k ELR20
R439	Resistor	680 ELR20
R440	Thermistor	33D28
R441	Resistor	390 R20
R442	Trimmer	RHB0C1324A 1k
R443	Resistor	100k ELR25
R444	Thermistor	33D28
R445	Resistor	15 ELR20
R446	Resistor	47 ELR20
R447	Resistor	1k ELR20
R448	Resistor	470 R20
R449	Resistor	330 ELR20
R450	Resistor	1M ELR20
R451	Trimmer	RHB0CS511A 470k
R452	Resistor	150 R20
R453	Resistor	150 ELR20
R454	Resistor	1k ELR20
R455	Resistor	220k ELR25
R456	Resistor	47k ELR20
R457	Resistor	270 R20
R458	Resistor	6.8k R20
R459	Resistor	56k ELR20

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
C1	Array	B8ZC0111-32N 0.0082x7
C2	Ceramic	2P 50V
C3	Ceramic	0.0047 50V
C4	Ceramic	0.0047 50V
C5	Ceramic	0.0047 50V
C7	Barrier Layer	0.1 16V
C8	Ceramic	0.0047 50V
C9	Ceramic	0.0047 50V
C10	Ceramic	33P 50V
C11	Ceramic	0.0047 50V
C12	Ceramic	22P 50V CH
C13	Ceramic	100P 50V CH
C14	Ceramic	100P 50V CH
C15	Trimmer	VCT51F126A 30P
C16	Ceramic	22P 50V CH
C17	Trimmer	VCT51C143A 10P
C18	Ceramic	10P 50V CH
C19	Ceramic	22P 50V CH
C20	Trimmer	VCT51A123A 6P
C21	Barrier Layer	0.01 25V
C22	Barrier Layer	0.01 25V
C23	Mylar	0.1 50V
C24	Mylar	0.15 50V
C25	Ceramic	0.0047 50V
C26	Ceramic	0.0047 50V
C27	Barrier Layer	0.1 16V
C28	Ceramic	0.0047 50V
C29	Ceramic	0.0047 50V
C30	Ceramic	0.0047 50V
C31	Electrolytic	2.2 50V MS7
C32	Barrier Layer	0.1 16V
C33	Ceramic	0.0047 50V
C34	Ceramic	0.001 50V
C35	Ceramic	0.0047 50V
C36	Mylar	0.01 50V
C37	Ceramic	330P 50V
C38	Mylar	0.01 50V
C39	Tantalum	0.47 35V
C40	Electrolytic	4.7 25V MS7
C41	Electrolytic	22 16V
C42	Ceramic	0.0047 50V
C43	Electrolytic	0.47 50V MS7
C44	Electrolytic	4.7 25V MS7
C45	Barrier Layer	0.1 16V
C46	Ceramic	0.001 50V
C47	Ceramic	0.0047 50V
C48	Ceramic	0.0047 50V
C50	Electrolytic	3.3 50V MS7
C52	Ceramic	0.0047 50V
C53	Ceramic	0.0047 50V
C54	Electrolytic	10 16V MS7
C55	Barrier Layer	0.047 25V
C56	Barrier Layer	0.1 16V
C57	Electrolytic	3.3 50V MS7
C58	Barrier Layer	0.047 25V
C59	Electrolytic	4.7 25V MS7
C60	Electrolytic	3.3 50V MS7
C62	Electrolytic	0.47 50V MS7
C63	Electrolytic	0.33 50V MS7
C64	Barrier Layer	0.1 16V
C65	Electrolytic	3.3 50V MS7
C66	Barrier Layer	0.1 16V

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
C68	Electrolytic	10 16V MS7
C69	Ceramic	0.0047 50V
C70	Ceramic	3P 50V
C71	Ceramic	2P 50V
C72	Ceramic	0.0047 50V
C75	Barrier Layer	0.047 25V
C76	Ceramic	0.001 50V
C77	Barrier Layer	0.1 16V
C78	Ceramic	22P 50V
C79	Ceramic	0.0047 50V
C80	Ceramic	0.0047 50V
C81	Ceramic	0.0047 50V
C82	Ceramic	0.0047 50V
C83	Electrolytic	4.7 25V MS7
C84	Electrolytic	10 16V MS7
C85	Electrolytic	47 16V
C86	Barrier Layer	0.1 16V
C87	Barrier Layer	0.1 16V
C88	Electrolytic	4.7 25V BP
C89	Ceramic	82P 50V
C90	Barrier Layer	0.1 16V
C91	Ceramic	0.0047 50V
C92	Electrolytic	100 10V
C93	Ceramic	0.001 50V
C94	Ceramic	27P 50V
C95	Ceramic	0.0047 50V
C96	Ceramic	0.0047 50V
C97	Ceramic	0.0047 50V
C98	Barrier Layer	0.1 16V
C99	Ceramic	0.0047 50V
C100	Ceramic	0.0047 50V
C101	Ceramic	0.0047 50V
C102	Ceramic	0.0047 50V
C103	Ceramic	0.0047 50V
C104	Barrier Layer	0.1 16V
C105	Ceramic	0.0047 50V
C106	Ceramic	0.0047 50V
C108	Barrier Layer	0.1 16V
C109	Ceramic	0.0047 50V
C110	Barrier Layer	0.1 16V
C111	Barrier Layer	0.1 16V
C112	Barrier Layer	0.1 16V
C113	Barrier Layer	0.1 16V
C114	Ceramic	220P 50V
C115	Barrier Layer	0.1 16V
C116	Electrolytic	0.1 50V MS7
C117	Electrolytic	4.7 25V MS7
C118	Ceramic	0.001 50V
C119	Ceramic	330P 50V
C120	Barrier Layer	0.0012 25V
C121	Barrier Layer	0.1 16V
C122	Barrier Layer	0.1 16V
C123	Ceramic	0.0047 50V
C124	Barrier Layer	0.1 16V
C125	Barrier Layer	0.0012 25V
C126	Barrier Layer	0.1 16V
C127	Barrier Layer	0.1 16V
C128	Barrier Layer	0.1 16V
C129	Barrier Layer	0.1 16V
C130	Barrier Layer	0.1 16V
C131	Barrier Layer	0.1 16V
C132	Barrier Layer	0.1 16V

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
C133	Barrier layer	0.1 16V
C134	Barrier Layer	0.1 16V
C135	Barrier Layer	0.1 16V
C136	Barrier Layer	0.1 16V
C137	Ceramic	0.0047 50V
C138	Ceramic	0.0047 50V
C139	Electrolytic	1 50V MS7
C140	Ceramic	0.0047 50V
C141	Barrier Layer	0.1 16V
C142	Ceramic	0.0047 50v
C143	Ceramic	0.0047 50V
C144	Ceramic	0.0047 50V
C145	Ceramic	5P 50V CH
C146	Trimmer	VCT51A123A 6P
C147	Ceramic	0.0047 50V
C148	Barrier Layer	0.01 25V
C149	Ceramic	0.0047 50V
C150	Ceramic	0.0047 50V
C151	Ceramic	0.0047 50V
C152	Ceramic	0.0047 50V
C153	Ceramic	0.0047 50V
C154	Ceramic	0.0047 50V
C155	Ceramic	0.0047 50V
C156	Ceramic	0.0047 50V
C157	Ceramic	22P 50V
C158	Barrier Layer	0.1 16V
C160	Ceramic	0.0047 50V
C161	Barrier Layer	0.1 16V
C163	Ceramic	470P 50V
C164	Barrier Layer	0.1 16V
C165	Barrier Layer	0.1 16V
C166	Ceramic	0.0047 50V
C167	Barrier Layer	0.1 16V
C168	Barrier Layer	0.1 16V
C169	Barrier Layer	0.1 16V
C170	Electrolytic	2.2 50V MS7
C171	Ceramic	0.0047 50V
C172	Ceramic	0.0047 50V
C173	Electrolytic	2.2 50V MS7
C174	Ceramic	0.0047 50V
C175	Mylar	0.01 50V
C176	Electrolytic	10 16V MS7
C177	Mylar	0.001 50V
C178	Mylar	0.0022 50V
C179	Ceramic	120P 50V
C180	Electrolytic	10 16V MS7
C181	Electrolytic	0.47 50V MS7
C182	Ceramic	0.0047 50V
C183	Barrier Layer	0.01 25V
C184	Ceramic	7P 50V CH
C185	Ceramic	10P 50V CH
C186	Ceramic	100P 50V CH
C187	Ceramic	100P 50V CH
C188	Ceramic	0.0047 50V
C189	Ceramic	15P 50V CH
C190	Ceramic	0.0047 50V
C191	Ceramic	27P 50V
C192	Ceramic	56P 50V
C193	Barrier Layer	0.1 16V
C194	Electrolytic	0.22 50V MS7
C195	Ceramic	0.0047 50V
C196	Barrier Layer	0.047 25V

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
C197	Ceramic	22P 50V
C198	Barrier Layer	0.047 25V
C199	Ceramic	220P 50V CH
C200	Ceramic	220P 50V CH
C201	Ceramic	30P 50V CH
C202	Trimmer	VCT51F126A 30P
C203	Ceramic	39P 50V CH
C204	Barrier Layer	0.047 25V
C205	Barrier Layer	0.047 25V
C206	Cylinder	TP125X 103M
C207	Barrier layer	0.047 25V
C208	Ceramic	180P 50V
C209	Ceramic	100P 50V
C210	Ceramic	0.0047 50V
C211	Ceramic	0.0047 50V
C212	Ceramic	2P 50V
C213	Ceramic	8P 50V
C214	Ceramic	100P 50V CH
C215	Ceramic	100P 50V CH
C216	Ceramic	0.0047 50V
C217	Ceramic	0.0047 50V
C218	Array	B8ZC0111-32N 0.0082x7
C219	Ceramic	0.0047 50V
C220	Electrolytic	10 16V MS7
C221	Barrier Layer	0.1 16V
C222	Electrolytic	0.47 50V MS7
C223	Ceramic	0.0047 50V
C224	Electrolytic	10 16V MS7
C225	Electrolytic	4.7 25V MS7
C226	Electrolytic	0.47 50V MS7
C227	Mylar	0.047 50V
C228	Electrolytic	1 50V MS7
C229	Tantalum	1 35V
C230	Tantalum	1.5 35V
C231	Ceramic	0.0047 50V
C232	Ceramic	0.0047 50V
C233	Tantalum	3.3 35V
C235	Barrier Layer	0.1 16V
C236	Electrolytic	4.7 25V
C237	Ceramic	0.0047 50V
C238	Electrolytic	470 16V
C239	Barrier Layer	0.1 16V
C240	Electrolytic	47 16V
C241	Electrolytic	47 16V
C243	Electrolytic	1000 16V MS16
C244	Barrier Layer	0.047 25V
C245	Electrolytic	100 16V
C246	Electrolytic	10 16V MS7
C247	Mylar	0.022 50V
C248	Mylar	0.022 50V
C249	Mylar	0.022 50V
C250	Tantalum	10 10V

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
C251	Mylar	0.022 50V
C252	Electrolytic	2.2 50V MS7
C253	Electrolytic	2.2 50V MS7
C254	Ceramic	0.001 50V
C255	Electrolytic	2.2 50V MS7
C256	Barrier Layer	0.047 25V
C257	Electrolytic	0.1 50V MS7
C258	Barrier Layer	0.1 16V
C259	Electrolytic	10 16V MS7
C260	Ceramic	0.0047 50V
C261	Barrier Layer	0.1 16V
C262	Mylar	0.01 50V
C263	Mylar	0.01 50V
C264	Mylar	0.033 50V
C265	Barrier Layer	0.047 25V
C266	Electrolytic	0.47 50V MS7
C267	Ceramic	0.0047 50V
C268	Ceramic	0.0047 50V
C269	Ceramic	82P 50V
C270	Electrolytic	0.1 50V MS7
C271	Barrier Layer	0.1 16V
C272	Ceramic	0.001 50V
C273	Ceramic	0.0047 50V
C274	Electrolytic	10 16V MS7
C275	Mylar	0.022 50V
C276	Mylar	0.001 50V
C277	Ceramic	330P 50V
C278	Array	B7ZC0715-32N 0.0022x6
C279	Array	B5RC0124-32N 0.001x4
C280	Electrolytic	10 16V MS7
C281	Ceramic	0.0047 50V
C282	Mylar	0.022 50V
C283	Electrolytic	22 16V
C284	Electrolytic	1 50V MS7
C285	Electrolytic	0.47 50V MS7
C286	Ceramic	0.001 50V
C287	Barrier Layer	0.1 16V
C289	Ceramic	10P 50V
C290	Electrolytic	10 16V MS7
C291	Barrier Layer	0.1 16V
C292	Barrier Layer	0.047 25V
C293	Electrolytic	10 16V MS7
C294	Mylar	0.01 50V
C295	Electrolytic	10 16V MS7
C296	Ceramic	0.0047 50V
C297	Electrolytic	0.47 50V MS7
C298	Ceramic	15P 50V UJ
C299	Barrier Layer	0.1 16V
C300	Barrier Layer	0.1 16V
C301	Ceramic	470P 50V
C302	Ceramic	100P 50V
C303	Barrier Layer	0.1 16V
C304	Ceramic	4P 50V CH
C305	Electrolytic	10 16V MS7
C306	Electrolytic	1 50V MS7
C307	Barrier Layer	0.1 16V
CP1	Check Point	IPS-1136
J1	Connector	TL25P-10-V1
J2	Connector	TL25P-03-V1
J3	Connector	TL25P-04-V1

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
J4	Connector	TMP-J01X-A2
J5	Connector	TL25P-08-V1
J6	Connector	TSL-P03P-B1
J7	Connector	TL25P-07-V1
J8	Connector	TL25P-09-V1
J9	Connector	TL25P-07-V1
J10	Connector	TL25P-07-V1
J11	Connector	TL25P-08-V1
J12	Connector	TL25P-08-V1
J13	Connector	TL25P-06-V1
J14	Connector	TL25P-05-V1
J15	Connector	TL25P-08-V1
J16	Connector	TL25P-08-V1
P1	Connector	TL25H-05-B1
S1	Switch	SSSS31124A
S2	Switch	SSSS31124A
S3	Switch	EVQ-RBA
S4	Switch	EVQ-RBA
S8	Switch	SSSS31124A
S01	Socket	380598-2
S02	Socket	380598-2
S03	Socket	380598-2
S04	Socket	380598-2
EP1	Ferrite Bead	FSQH050RN
EP2	P.C.Board	B-1035C
EP3	P.C.Board	B-1169
EP9	Rubber Grommet	B-312
EP10	Mica Plate	P-103KD
EP11	Ferrite Bead	FSQH070RN
EP16	Ferrite Bead	FSQH070RN
W1	Jumper	IPS-1041-2
W2	Jumper	IPS-1041-2
W3	Jumper	IPS-1041-2
W4	Jumper	IPS-1041-2
W5	Jumper	IPS-1041-2
W6	Jumper	IPS-1041-2
W7	Jumper	IPS-1041-4
W8	Jumper	IPS-1041-2
W9	Jumper	IPS-1041-2
W10	Jumper	IPS-1041-2
W11	Jumper	JPW-02A
W12	Jumper	IPS-1041-2
W13	Jumper	IPS-1041-2
W14	Jumper	IPS-1041-2
W15	Jumper	IPS-1041-4
W16	Jumper	IPS-1041-2
W18	Jumper	IPS-1041-4
W19	Jumper	IPS-1041-2
W20	Jumper	IPS-1041-2
W21	Jumper	IPS-1041-4
W22	Jumper	IPS-1041-4
W23	Jumper	IPS-1041-2
W24	Jumper	IPS-1041-4
W25	Jumper	IPS-1041-4
W26	Jumper	IPS-1041-2
W27	Jumper	IPS-1041-2
W28	Jumper	IPS-1041-2

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
W29	Jumper	IPS-1041-2
W30	Jumper	IPS-1041-2
W32	Jumper	IPS-1041-4
W33	Jumper	IPS-1041-2
W34	Jumper	IPS-1041-4
W35	Jumper	IPS-1041-4
W36	Jumper	IPS-1041-2
W37	Jumper	IPS-1041-2
W38	Jumper	IPS-1041-2
W39	Jumper	IPS-1041-2
W40	Jumper	IPS-1041-2
W41	Jumper	IPS-1041-4
W43	Jumper	IPS-1041-2
W44	Jumper	IPS-1041-2
W45	Jumper	IPS-1041-4
W46	Jumper	IPS-1041-4
W47	Jumper	IPS-1041-2
W48	Jumper	IPS-1041-2
W49	Jumper	IPS-1041-2
W50	Jumper	IPS-1041-2
W51	Jumper	IPS-1041-4
W52	Jumper	IPS-1041-2
W53	Jumper	IPS-1041-4
W54	Jumper	JPW-02A
W55	Jumper	IPS-1041-2
W56	Jumper	IPS-1041-4
W57	Jumper	IPS-1041-4
W58	Jumper	IPS-1041-2
W59	Jumper	IPS-1041-4
W60	Jumper	IPS-1041-2
W61	Jumper	IPS-1041-2
W62	Jumper	IPS-1041-2
W63	Jumper	IPS-1041-2
W64	Jumper	IPS-1041-2
W65	Jumper	IPS-1041-4
W66	Jumper	IPS-1041-4
W67	Jumper	IPS-1041-4
W69	Jumper	IPS-1041-2
W70	Jumper	IPS-1041-2
W71	Jumper	IPS-1041-2
W72	Jumper	IPS-1041-4
W73	Jumper	IPS-1041-4
W75	Jumper	IPS-1041-2
W76	Jumper	IPS-1041-2
W77	Jumper	IPS-1041-4
W78	Jumper	IPS-1041-2
W79	Jumper	IPS-1041-2
W80	Jumper	IPS-1041-2
W81	Jumper	IPS-1041-4
W82	Jumper	IPS-1041-4
W83	Jumper	IPS-1041-4
W84	Jumper	IPS-1041-4
W85	Jumper	IPS-1041-2
W86	Jumper	JPW-02H
W87	Jumper	IPS-1041-2
W88	Jumper	IPS-1041-2
W89	Jumper	IPS-1041-2
W90	Jumper	IPS-1041-2
W92	Jumper	IPS-1041-4
W93	Jumper	IPS-1041-4
W94	Jumper	IPS-1041-4
W95	Jumper	IPS-1041-4
W96	Jumper	IPS-1041-2
W97	Jumper	IPS-1041-2

MAIN UNIT

REF. NO.	DESCRIPTION	PART NO.
W98	Jumper	IPS-1041-2
W99	Jumper	IPS-1041-2
W100	Jumper	23/00/170/D21/D21
W101	Jumper	23/01/105/D21/D21
W102	Jumper	23/02/155/D21/D21
W103	Jumper	[61/99/150/W13A/W13A
W104	Jumper	08 A A]
W105	Jumper	23/05/145/D21/D21
W106	Jumper	23/06/170/D21/D21
W107	Jumper	[61/99/305/W13A/W13A
W108	Jumper	08 A A]
W109	Jumper	23/09/120/D21/D21
W110	Jumper	23/00/110/D21/D21
W111	Jumper	23/01/150/D21/D21
W112	Jumper	23/02/180/D21/D21
W113	Jumper	23/03/220/D21/D21
W114	Jumper	23/04/140/D21/D21
W115	Jumper	23/05/200/D21/D21
W116	Jumper	23/06/060/D21/D21
W117	Jumper	23/07/120/D21/D21
W118	Jumper	23/08/070/D21/D21
W119	Jumper	23/09/100/D21/D21
W120	Jumper	23/00/140/D21/D21
W121	Jumper	[51/99/150/W13A/W13A
W122	Jumper	08 A A]
W123	Jumper	23/03/250/D21/D21
W124	Jumper	[61/99/280/W13A/W13A
W125	Jumper	08 A A]
W126	Jumper	[61/99/230/W13A/W13A
W127	Jumper	08 A A]
W128	Jumper	23/08/180/D21/D21
W129	Jumper	23/09/130/D21/D21
W130	Jumper	23/00/105/D21/D21
W131	Jumper	23/01/155/D21/D21
W132	Jumper	23/02/235/D21/D21
W133	Jumper	23/03/125/D21/D21
W134	Jumper	[61/99/300/W13A/W13A
W135	Jumper	08 A A]
W136	Jumper	23/06/300/D21/D21
W137	Jumper	23/07/065/D21/D21
W138	Jumper	23/08/205/D21/D21
W139	Jumper	23/09/150/D21/D21
W140	Jumper	23/00/140/D21/D21
W141	Jumper	23/01/165/D21/D21
W142	Jumper	23/02/165/D21/D21
W143	Jumper	23/03/120/D21/D21
W144	Jumper	[51/99/210/W13A/W13A
W145	Jumper	08 A A]
W146	Jumper	23/06/070/D21/D21
W147	Jumper	23/07/100/D21/D21
W148	Jumper	23/08/070/D21/D21
W150	Jumper	23/00/150/D21/D21
W151	Jumper	[51/99/135/W13A/W13A
W152	Jumper	08 A A]
W153	Jumper	[51/99/105/W13A/W13A
W154	Jumper	08 A A]
W155	Jumper	23/05/280/D21/C01
W156	Jumper	23/06/300/D21/C01
W157	Jumper	23/07/255/D21/C01
W158	Jumper	23/08/200/D21/C01
W159	Jumper	23/09/065/D21/D21
W160	Jumper	72/99/005/X98/X98
W161	Jumper	74/98/015/X98/X98
W162	Jumper	74/98/020/X98/X98

10 - 8 RF UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	BA618
IC2	IC	BA618
IC3	IC	ND487C1-3R
Q1	Transistor	2SC945-P/Q
Q2	Transistor	2SC2053
Q3	Transistor	2SA1048-Y
Q5	Transistor	2SC1571-G
Q6	FET	2SK125
Q7	FET	2SK125
Q8	FET	3SK74-M
Q9	FET	2SK125
Q10	FET	2SK125
Q11	FET	3SK74-M
Q12	FET	3SK74-K
Q13	FET	3SK74-K
Q14	Transistor	2SC2053
Q15	Transistor	2SC2878
Q16	Transistor	2SC3402
Q17	Transistor	2SC945-P/Q
Q18	Transistor	2SC3402
Q19	Transistor	2SC3402
Q20	Transistor	2SD468-C
Q21	Transistor	2SC3399
D1	Diode	1S953
D2	Diode	1S953
D3	Diode	1SS53
D4	Diode	1SS53
D5	Diode	1N4002
D6	Diode	1N4002
D7	Diode	1SS53
D9	Diode	1SS53
D10	Diode	MI204
D11	Diode	MI204
D12	Diode	1SS53
D13	Diode	1SS53
D14	Diode	1SS53
D15	Diode	1SS53
D16	Diode	1SS53
D17	Diode	1SS53
D18	Diode	1SS53
D19	Diode	1SS53
D20	Diode	1SS53
D21	Diode	1SS53
D22	Diode	1SS53
D23	Diode	1SS53
D24	Diode	1SS53
D25	Diode	1SS53
D26	Diode	1SS53
D27	Diode	1SS53
D28	Diode	1SS53
D29	Diode	1SS53
D30	Diode	1SS53
D31	Diode	1SS53
D32	Diode	1SS53
D33	Diode	1SS53
D34	Diode	1SS53
D35	Diode	1SS53
D36	Diode	1SS53
D37	Diode	1SS53
D38	Diode	1SS53

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
D39	Diode	1SS53
D40	Diode	1SS53
D41	Diode	MI204
D42	Diode	MI204
D43	Diode	MI204
D44	Diode	MI204
D45	Diode	1SS53
D46	Diode	1SS55
D47	Diode	MI204
D48	Diode	1SS53
D49	Diode	1SS53
D50	Diode	1SS53
D51	Zener	RD9.1E B3
D52	Diode	1SS53
D53	Diode	1SS53
D54	Diode	1SS53
FI1	Monolithic	FL-64
L1	Coil	EL0810SKI 101K
L2	Coil	EL0810SKI 101K
L3	Coil	EL0810SKI 101K
L4	Coil	EL0810SKI 102K
L5	Coil	EL0810SKI 102K
L6	Coil	FL5H 102K
L7	Coil	FL5H 102K
L8	Coil	EL0810SKI 101K
L9	Coil	EL0810SKI 101K
L10	Coil	EL0810SKI 101K
L11	Coil	EL0810SKI 101K
L12	Coil	LB4 R15
L13	Coil	LB4 R50
L14	Coil	FL5H 101K
L15	Coil	LR-151
L16	Coil	LR-170
L17	Coil	LS-114
L18	Coil	LS-254
L19	Coil	LS-254
L20	Coil	LS-254
L21	Coil	LS-198
L22	Coil	LR-171
L23	Coil	LA-268
L24	Coil	LA-258
L25	Coil	S4 102K
L26	Coil	LB4 R83
L27	Coil	LR-116
L28	Coil	LR-116
L29	Coil	LA-96
L30	Coil	LB-86A
L31	Coil	LS-114
L32	Coil	LS-114
L33	Coil	LS-198
L34	Coil	LR-75A
L35	Coil	FL5H 102K
L36	Coil	EL0810SKI 102K
L37	Coil	FL5H 102K
L38	Coil	FL5H 102K
L39	Coil	FL5H 102K
L40	Coil	FL5H 102K
L41	Coil	LR-130
L42	Coil	LR-129
L43	Coil	FL5H 102K

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
L44	Coil	LB4 R34
L45	Coil	LB4 R36
L46	Coil	LB4 R30
L47	Coil	LB4 R36
L48	Coil	FL5H 101K
L49	Coil	LB4 R45
L50	Coil	LB4 R50
L51	Coil	LB4 R50
L52	Coil	LB4 R54
L53	Coil	FL5H 101K
L54	Coil	LB4 R54
L55	Coil	LB4 R65
L56	Coil	LB4 R65
L57	Coil	LB4 R83
L58	Coil	FL5H 101K
L59	Coil	LB4 R70
L60	Coil	LB4 R83
L61	Coil	EL0810SKI 1R0K
L62	Coil	EL0810SKI 1R0K
L63	Coil	FL5H 101K
L64	Coil	EL0810SKI 1R0K
L65	Coil	EL0810SKI 1R2K
L66	Coil	EL0810SKI 1R2K
L67	Coil	EL0810SKI 1R2K
L68	Coil	FL5H 101K
L69	Coil	EL0810SKI 1R5K
L70	Coil	EL0810SKI 1R5K
L71	Coil	EL0810SKI 1R8K
L72	Coil	EL0810SKI 1R8K
L73	Coil	FL5H 101K
L74	Coil	EL0810SKI 1R8K
L75	Coil	EL0810SKI 1R8K
L76	Coil	EL0810SKI 2R2K
L77	Coil	EL0810SKI 2R7K
L78	Coil	FL5H 101K
L79	Coil	EL0810SKI 2R7K
L80	Coil	EL0810SKI 3R3K
L81	Coil	EL0810SKI 3R3K
L82	Coil	LB4 4R3
L83	Coil	FL5H 102K
L84	Coil	LB4 3R6
L85	Coil	LB4 4R3
L86	Coil	LB4 5R1
L87	Coil	LB4 6R2
L88	Coil	FL5H 102K
L89	Coil	FL5H 102K
L90	Coil	LB4 6R2
L91	Coil	LB4 5R1
L92	Coil	FL5H 102K
L93	Coil	EL0810SKI 220K
L94	Coil	EL0810SKI 220K
L95	Coil	S4 102K
L96	Coil	LR-20
L97	Coil	FL5H 102K
L98	Coil	FL5H 101K
L99	Coil	FL5H 102K
L100	Coil	FL5H 102K
L101	Coil	EL0810SKI 4R7K
L102	Coil	EL0810SKI 3R3K
L103	Coil	S4 102K
L104	Coil	BT01RN1-A61
L105	Coil	BT01RN1-A61

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
L106	Coil	LAL03NA 100K
L107	Coil	LAL03NA 100K
R1	Resistor	2.2 ELR20
R2	Resistor	10k R20
R3	Resistor	10k ELR25
R4	Resistor	10k ELR25
R5	Resistor	10k ELR25
R6	Resistor	10k ELR25
R7	Resistor	10k ELR25
R8	Resistor	10k R25
R9	Resistor	33k ELR25
R10	Resistor	33k ELR25
R11	Resistor	10k ELR20
R12	Resistor	10k R25
R13	Resistor	2.2 ELR20
R14	Array	RMX-6 10k
R15	Resistor	470 ELR25
R16	Resistor	680 ELR25
R17	Resistor	8.2k ELR25
R18	Resistor	560 ELR25
R19	Resistor	100 ELR25
R20	Resistor	1k ELR25
R21	Resistor	33 ELR25
R22	Resistor	220 ELR25
R23	Resistor	100 ELR25
R24	Trimmer	RHB0CJ30EA 2.2k
R25	Resistor	330 ELR25
R26	Resistor	22k ELR25
R27	Resistor	47 ELR25
R28	Resistor	47 ELR25
R29	Resistor	10k ELR20
R30	Resistor	100 ELR25
R31	Resistor	390 ELR25
R32	Resistor	47 ELR25
R33	Resistor	10k ELR25
R34	Resistor	12k ELR25
R35	Resistor	220 ELR25
R36	Resistor	2.2k ELR25
R37	Resistor	22 ELR25
R38	Resistor	22 ELR25
R39	Resistor	100 R25
R40	Resistor	100 ELR25
R41	Resistor	100 ELR25
R42	Resistor	3.9k R20
R43	Resistor	56 ELR20
R44	Resistor	470k ELR25
R45	Resistor	47 R25
R46	Resistor	560 R20
R47	Resistor	560 R20
R48	Resistor	220 R25
R49	Resistor	150 ELR20
R50	Resistor	8.2 R20
R51	Resistor	8.2 R20
R52	Resistor	150 R20
R53	Resistor	2.2k ELR25
R54	Resistor	100 ELR20
R55	Resistor	100k ELR25
R56	Resistor	10k ELR25
R57	Resistor	820 ELR25
R58	Resistor	100 ELR25
R59	Resistor	1.5k R20

RF UNIT

REF. NO.	DESCRIPTION	PART NO.	
R60	Resistor	100	ELR25
R61	Resistor	150	ELR25
R62	Resistor	10k	ELR25
R63	Resistor	68	ELR25
R64	Resistor	68	ELR25
R65	Resistor	47	ELR25
R66	Resistor	100	ELR25
R67	Resistor	100	ELR20
R68	Resistor	100	ELR25
R69	Resistor	100	R25
R70	Resistor	100	R25
R71	Resistor	100	R25
R72	Resistor	100	R25
R73	Resistor	100	R25
R74	Resistor	100	R25
R75	Resistor	100	R25
R76	Resistor	100	R25
R77	Resistor	100	R25
R78	Resistor	100	R25
R79	Resistor	470	ELR25
R80	Resistor	82	ELR25
R81	Resistor	680	ELR25
R82	Resistor	4.7k	ELR25
R83	Resistor	100	ELR25
R84	Resistor	220	ELR20
R85	Resistor	4.7	ELR25
R86	Resistor	1	ELR25
R87	Resistor	10k	ELR25
R88	Resistor	220	ELR25
R89	Resistor	2.2k	ELR25
R90	Resistor	4.7k	ELR25
R91	Resistor	470	ELR25
R92	Resistor	56	ELR25
R93	Resistor	470	ELR20
R94	Resistor	8.2k	ELR20
R95	Resistor	2.2k	ELR25
R96	Resistor	4.7k	ELR20
R97	Resistor	470	R20
R100	Resistor	390	ELR20
R101	Resistor	4.7k	ELR25
R102	Resistor	4.7k	R25
R104	Resistor	82	ELR25
R105	Resistor	2.2k	R25
R106	Resistor	2.2k	ELR25
R108	Resistor	27	R25
R109	Resistor	33	ELR25
R110	Resistor	27	ELR25
R111	Resistor	820	ELR20
R112	Resistor	1k	ELR20
R113	Resistor	100	R25
R114	Resistor	2.2k	ELR25
R115	Resistor	47k	ELR25
R116	Resistor	680k	ELR25
R117	Resistor	10k	R25
R118	Resistor	15k	ELR20
R119	Resistor	15k	ELR25
R120	Resistor	2.2k	R20
R121	Resistor	3.3k	ELR20
R122	Resistor	1k	R25
R123	Thermistor	23D29	
R124	Resistor	10k	ELR25
R125	Trimmer	RHM0AS304A 4.7k	

RF UNIT

REF. NO.	DESCRIPTION	PART NO.		
C1	Array	B8ZC0111-32N 0.0082x7		
C2	Array	B8ZC0111-32N 0.0082x7		
C3	Barrier Layer	0.047	25V	
C6	Array	B8ZC0111-32N 0.0082x7		
C7	Array	B8ZC0111-32N 0.0082x7		
C11	Ceramic	39P	50V	
C12	Ceramic	39P	50V	
C13	Ceramic	220P	50V	
C14	Ceramic	0.001	50V	
C15	Barrier Layer	0.047	25V	
C16	Electrolytic	2.2	50V	MS7
C17	Ceramic	0.001	50V	
C18	Ceramic	8P	50V	
C19	Ceramic	5P	50V	
C20	Ceramic	15P	50V	
C21	Ceramic	1P	50V	
C22	Ceramic	10P	50V	
C23	Barrier Layer	0.047	25V	
C24	Barrier Layer	0.1	16V	
C25	Barrier Layer	0.1	16V	
C26	Barrier Layer	0.047	25V	
C27	Barrier Layer	0.047	25V	
C28	Barrier Layer	0.047	25V	
C29	Barrier Layer	0.047	25V	
C30	Electrolytic	0.47	50V	MS7
C31	Barrier Layer	0.047	25V	
C32	Ceramic	220P	50V	
C33	Barrier Layer	0.047	25V	
C34	Barrier Layer	0.047	25V	
C35	Barrier Layer	0.047	25V	
C36	Barrier Layer	0.047	25V	
C37	Barrier Layer	0.047	25V	
C38	Barrier Layer	0.047	25V	
C39	Barrier Layer	0.047	25V	
C40	Barrier Layer	0.047	25V	
C41	Ceramic	2P	50V	
C42	Ceramic	6P	50V	
C43	Ceramic	0.0047	50V	
C44	Ceramic	0.0047	50V	
C45	Mylar	0.022	50V	
C47	Ceramic	0.001	50V	
C48	Ceramic	3P	50V	
C49	Ceramic	10P	50V	
C50	Ceramic	8P	50V	
C51	Barrier Layer	0.1	16V	
C52	Ceramic	8P	50V	
C54	Barrier Layer	0.047	25V	
C55	Electrolytic	1	50V	
C56	Ceramic	82P	50V	
C57	Ceramic	150P	50V	
C58	Ceramic	10P	50V	
C59	Ceramic	30P	50V	
C61	Barrier Layer	RAU08SA 821K 50V 820P		
C62	Barrier Layer	RAU08SA 821K 50V 820P		
C63	Ceramic	0.0047	50V	
C64	Ceramic	27P	50V	
C65	Ceramic	82P	50V	
C66	Ceramic	24P	50V	
C67	Ceramic	24P	50V	
C68	Ceramic	39P	50V	
C69	Ceramic	0.0047	50V	
C70	Ceramic	6P	50V	

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
C71	Barrier Layer	0.1 16V
C72	Ceramic	0.001 50V
C73	Ceramic	0.0047 50V
C74	Ceramic	0.0047 50V
C75	Ceramic	0.0047 50V
C76	Ceramic	8P 50V UJ
C77	Ceramic	15P 50V
C78	Ceramic	3P 50V
C79	Barrier Layer	0.047 25V
C80	Barrier Layer	0.047 25V
C81	Barrier Layer	0.047 25V
C82	Barrier Layer	0.047 25V
C84	Barrier Layer	0.047 25V
C85	Ceramic	100P 50V
C86	Barrier Layer	RAU08SA 821K 50V 820P
C87	Ceramic	270P 50V
C88	Ceramic	68P 50V
C89	Ceramic	56P 50V
C90	Ceramic	120P 50V
C91	Ceramic	30P 50V
C92	Barrier Layer	0.047 25V
C93	Barrier Layer	0.047 25V
C94	Ceramic	150P 50V
C95	Barrier Layer	UAT04V 122K 50V 0.0012
C96	Ceramic	300P 50V
C97	Ceramic	100P 50V
C98	Ceramic	24P 50V
C99	Ceramic	220P 50V
C100	Barrier Layer	0.047 25V
C101	Barrier Layer	0.047 25V
C102	Ceramic	200P 50V
C103	Barrier Layer	UAT04V 182K 50V 0.0018
C104	Ceramic	300P 50V
C105	Ceramic	270P 50V
C106	Ceramic	39P 50V
C107	Ceramic	390P 50V
C108	Barrier Layer	0.047 25V
C109	Barrier Layer	0.047 25V
C110	Ceramic	300P 50V
C111	Barrier Layer	UAT04V 222K 50V 0.0022
C112	Ceramic	330P 50V
C113	Ceramic	150P 50V
C114	Ceramic	51P 50V
C115	Ceramic	390P 50V
C116	Barrier Layer	0.047 25V
C117	Barrier Layer	0.047 25V
C118	Ceramic	390P 50V
C119	Barrier Layer	UAT05V 272K 50V 0.0027
C120	Ceramic	DD109SL471J50V02 470P
C121	Ceramic	DD109SL511J50V02 510P
C122	Ceramic	75P 50V
C123	Barrier Layer	RAU06SA 561K 50V 560P
C124	Barrier Layer	0.047 25V
C125	Barrier Layer	0.047 25V
C126	Barrier Layer	RAU06SA 561K 50V 560P
C127	Barrier Layer	UAT06V 562K 50V 0.0056
C128	Barrier Layer	UAT04V 102K 50V 0.001
C129	Barrier Layer	RAU08SA 681K 50V 680P
C130	Ceramic	82P 50V
C131	Barrier Layer	RAU08SA 681K 50V 680P
C132	Barrier Layer	0.047 25V
C133	Barrier Layer	0.047 25V

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
C134	Barrier Layer	UAT04V 102K 50V 0.001
C135	Barrier Layer	UAT06V 682K 50V 0.0068
C136	Barrier Layer	UAT04V 122K 50V 0.0012
C137	Barrier Layer	UAT04V 102K 50V 0.001
C138	Ceramic	150P 50V
C139	Barrier Layer	UAT04V 152K 50V 0.0015
C140	Barrier Layer	0.047 25V
C141	Barrier Layer	0.047 25V
C142	Barrier Layer	UAT04V 122K 50V 0.0012
C143	Barrier Layer	UAT06V 103K 50V 0.01
C144	Barrier Layer	UAT04V 182K 50V 0.0018
C145	Barrier Layer	UAT04V 152K 50V 0.0015
C146	Ceramic	200P 50V
C147	Barrier Layer	UAT04V 152K 50V 0.0015
C148	Barrier Layer	0.047 25V
C149	Barrier Layer	0.047 25V
C150	Barrier Layer	UAT04V 152K 50V 0.0015
C151	Barrier Layer	UAT06V 123K 50V 0.012
C152	Barrier Layer	UAT04V 222K 50V 0.0022
C153	Barrier Layer	UAT04V 222K 50V 0.0022
C154	Ceramic	270P 50V
C155	Barrier Layer	UAT04V 222K 50V 0.0022
C156	Barrier Layer	0.047 25V
C157	Barrier Layer	0.1 16V
C158	Barrier Layer	0.047 25V
C159	Barrier Layer	UAT05V 332K 50V 0.0033
C160	Ceramic	390P 50V
C161	Barrier Layer	UAT05V 332K 50V 0.0033
C162	Electrolytic	1 50V BP
C163	Barrier Layer	0.1 16V
C164	Barrier Layer	UAT06V 682K 50V 0.0068
C165	Barrier Layer	UAT04V 102K 50V 0.001
C166	Barrier Layer	UAT06V 822K 50V 0.0082
C167	Barrier Layer	0.1 16V
C168	Electrolytic	10 16V
C169	Barrier Layer	0.047 25V
C170	Barrier Layer	0.047 25V
C171	Barrier Layer	UAT04V 152K 50V 0.0015
C172	Barrier Layer	0.1 16V
C173	Barrier Layer	0.047 25V
C174	Barrier Layer	0.047 25V
C175	Barrier Layer	0.047 25V
C176	Barrier Layer	0.047 25V
C177	Barrier Layer	0.047 25V
C178	Barrier Layer	0.1 16V
C179	Barrier Layer	0.1 16V
C180	Barrier Layer	UAT04V 182K 50V 0.0018
C181	Barrier Layer	UAT04V 152K 50V 0.0015
C182	Barrier Layer	UAT05V 472K 50V 0.0047
C183	Barrier Layer	0.1 16V
C184	Barrier Layer	0.1 16V
C185	Barrier Layer	0.047 25V
C186	Barrier Layer	0.047 25V
C187	Tantalum	3.3 16V
C188	Barrier Layer	0.047 25V
C189	Barrier Layer	0.1 16V
C190	Barrier Layer	0.1 16V
C191	Ceramic	0.001 50V
C192	Ceramic	0.0047 50V
C193	Ceramic	0.0047 50V
C195	Ceramic	0.0047 50V
C196	Barrier Layer	0.1 16V

RF UNIT

REF. NO.	DESCRIPTION	PART NO.
C198	Ceramic	0.001 50V
C199	Ceramic	0.001 50V
C202	Ceramic	5P 50V
C203	Ceramic	0.0047 50V
C204	Tantalum	4.7 16V
C205	Barrier Layer	0.1 16V
C206	Ceramic	0.001 50V
RL1	Relay	FBR21D12-P
J1	Connector	TL25P-06-V1
J2	Connector	TL25P-05-V1
J3	Connector	TL25P-07-V1
J4	Connector	TL25P-02-V1
J5	Connector	TL25P-05-V1
J6	Connector	TL25P-02-V1
J8	Connector	TMP-J01X-A2
J9	Connector	TL25P-02-V1
J10	Connector	TMP-J01X-A2
J11	Connector	TLB-P06H-B1
J12	Connector	TLB-P05H-B1
J13	Connector	TLB-P02H-B1
J14	Connector	TLB-P02H-B1
P1	Connector	TMP-P01X-A1
P2	Connector	TMP-P01X-A1
P3	Connector	TMP-P01X-A1
EP1	P.C. Board	B-701E
EP8	Ferrite Bead	FSQH070RN
EP9	Ferrite Bead	FSQH070RN
EP11	Ferrite Bead	FSQH070RN
W1	Jumper	23/01/190/C22/D21
W2	Jumper	23/02/130/C22/D21
W3	Jumper	23/03/100/C22/D21
W4	Jumper	23/04/150/C22/D21
W5	Jumper	23/05/095/C22/D21
W6	Jumper	23/06/175/D21/D21
W7	Jumper	23/07/210/D21/D21
W8	Jumper	23/01/075/C22/D21
W9	Jumper	23/02/075/C22/D21
W10	Jumper	23/03/085/C22/D21
W11	Jumper	23/04/085/C22/D21
W12	Jumper	23/05/060/C22/D21
W13	Jumper	23/06/100/C22/D21
W14	Jumper	23/02/155/D21/D21
W15	Jumper	23/01/155/D21/D21
W16	Jumper	23/09/090/C22/C22
W17	Jumper	23/08/090/C22/C22
W18	Jumper	61/99/190/W13A/W13A 08 A A
W19	Jumper	
W20	Jumper	62/99/310/C31/W13D 08 C31 D
W21	Jumper	
W22	Jumper	62/99/205/C31/W13D 08 C31 D
W23	Jumper	
W24	Jumper	JPW-02H
W25	Jumper	JPW-02H
W26	Jumper	JPW-02H
W27	Jumper	JPW-02H
W28	Jumper	IPS-1041-4
W29	Jumper	JPW-02A
W30	Jumper	IPS-1041-4

RF UNIT/FILTER UNIT

REF. NO.	DESCRIPTION	PART NO.
W34	Jumper	IPS-1041-4
W35	Jumper	IPS-1041-4
W36	Jumper	IPS-1041-4
W37	Jumper	IPS-1041-4
W38	Jumper	IPS-1041-4
W39	Jumper	IPS-1041-4
W40	Jumper	JPW-02A
W42	Jumper	JPW-02A
W44	Jumper	IPS-1041-4
W45	Jumper	IPS-1041-4
W46	Jumper	IPS-1041-4
W47	Jumper	IPS-1041-4
W48	Jumper	62/99/190/C31/W13D 08 D
W49	Jumper	
W52	Jumper	23/07/080/D21/D21
W53	Jumper	74/99/010/X98/X98
W54	Jumper	JPW-02A
W56	Jumper	74/99/010/X98/X98

10 - 9 FILTER UNIT

REF. NO.	DESCRIPTION	PART NO.
D1	Diode	1K60
D2	Diode	1K60
D3	Diode	1N4002
D4	Diode	1N4002
D5	Diode	1N4002
D6	Diode	1N4002
D7	Diode	1N4002
D8	Diode	1N4002
D9	Diode	1N4002
L2	Coil	LR-137
L3	Coil	LR-137
L5	Coil	LR-138
L6	Coil	LR-139
L7	Coil	LR-140
L8	Coil	LR-141
L9	Coil	LR-141
L10	Coil	LR-90
L11	Coil	LR-91
L12	Coil	LR-53
L13	Coil	LR-54
L14	Coil	LA-166
L15	Coil	LA-165
L16	Coil	LA-168
L17	Coil	LA-167
L18	Coil	LR-22A
L19	Coil	L6 222
L20	Coil	FL5H 101K
L21	coil	FL5H 101K
L22	Coil	FL5H 101K
L23	Coil	FL5H 101K
L24	Coil	FL5H 101K
L25	Coil	FL5H 101K
L26	Coil	FL5H 101K
L27	Coil	FL5H 101K
L28	Coil	FL4H 100K
L29	Coil	FL4H 100K
L30	Coil	FL4H 100K

FILTER UNIT

REF. NO.	DESCRIPTION	PART NO.
L31	Coil	FL4H 100K
L32	Coil	FL4H 100K
L33	Coil	FL4H 100K
L34	Coil	LA-256
R1	Resistor	68 R50X
R2	Resistor	5.6K R25
R3	Resistor	5.6K R25
R4	Resistor	56K ELR25
R5	Resistor	56K ELR25
R6	Resistor	120 R25
C1	Dip Mica	DM20C152J51CR 0.0015
C2	Dip Mica	DM19C471J51CR 470P
C3	Dip Mica	DM20C272J51CR 0.0027
C4	Ceramic	220P 500V
C5	Dip Mica	DM20C152J51CR 0.0015
C6	Dip Mica	DM19C561J51CR 560P
C7	Ceramic	220P 500V
C8	Dip Mica	DM20C122J51CR 0.0012
C9	Ceramic	68P 500V
C10	Dip Mica	DM19C681J51CR 680P
C11	Dip Mica	DM19C471J51CR 470P
C12	Ceramic	120P 500V
C13	Dip Mica	DM19C561J51CR 560P
C14	Ceramic	68P 500V
C15	Ceramic	270P 500V
C16	Ceramic	220P 500V
C17	Ceramic	27P 500V
C18	Dip Mica	DM19C471J51CR 47OP
C19	Ceramic	68P 500V
C20	Ceramic	220P 500V
C21	Ceramic	180P 500V
C22	Ceramic	18P 500V
C23	Ceramic	330P 500V
C24	Ceramic	56P 500V
C25	Ceramic	180P 500V
C26	Ceramic	68P 500V
C27	Ceramic	10P 500V
C28	Ceramic	220P 500V
C29	Ceramic	47P 500V
C30	Ceramic	100P 500V
C31	Ceramic	68P 500V
C32	Ceramic	10P 500V
C33	Ceramic	180P 500V
C34	Ceramic	33P 500V
C35	Ceramic	68P 500V
C36	Trimmer	ECV-1ZW20x40
C37	Ceramic	150P 50V
C38	Ceramic	0.001 50V
C39	Ceramic	0.001 50V
C40	Ceramic	82P 500V
C42	Barrier Layer	0.047 25V
C43	Barrier Layer	0.047 25V
C44	Barrier Layer	0.047 25V
C45	Barrier Layer	0.047 25V
C46	Barrier Layer	0.047 25V
C47	Barrier Layer	0.047 25V
C48	Barrier Layer	0.047 25V
C49	Barrier Layer	0.047 25V
C50	Ceramic	0.0047 50V

FILTER UNIT

REF. NO.	DESCRIPTION	PART NO.
C51	Ceramic	0.0047 50V
C52	Ceramic	0.0047 50V
C53	Ceramic	0.0047 50V
C54	Ceramic	0.0047 50V
C55	Ceramic	0.0047 50V
RL1	Relay	FBR313D012-22
RL2	Relay	FBR313D012-22
RL3	Relay	FBR313D012-22
RL4	Relay	FBR313D012-22
RL5	Relay	FBR313D012-22
RL6	Relay	FBR313D012-22
RL7	Relay	FBR313D012-22
RL8	Relay	FBR313D012-22
RL9	Relay	FBR313D012-22
RL10	Relay	FBR313D012-22
RL11	Relay	FBR313D012-22
RL12	Relay	FBR313D012-22
RL13	Relay	FBR313D012-22
RL14	Relay	FBR313D012-22
J1	Connector	TMP-J01X-V2
J2	Connector	TL25P-02-V1
P1	Connector	TL25H-07-B1
P2	Connector	TMP-P01X-A1
EP1	P.C. Board	B-703D
W1	Jumper	23/01/150/C01/D21
W2	Jumper	23/02/240/C01/D21
W3	Jumper	23/03/190/C01/D21
W4	Jumper	23/04/260/C01/D21
W5	Jumper	23/05/280/C01/D21
W6	Jumper	23/06/300/C01/D21
W7	Jumper	23/07/330/C01/D21
W8	Jumper	[62/99/110/C31/W13D
W9	Jumper	] 08 C31 D]
W10	Jumper	JPW-02A
W11	Jumper	JPW-02A
W12	Jumper	JPW-02A
W13	Jumper	JPW-02A
W14	Jumper	JPW-02A
W15	Jumper	JPW-02A
W16	Jumper	JPW-02A
W17	Jumper	JPW-02A
W18	Jumper	JPW-02A
W19	Jumper	JPW-02A
W20	Jumper	JPW-02A
W21	Jumper	JPW-02A
W22	Jumper	JPW-02A
W23	Jumper	JPW-02A
W24	Jumper	JPW-02A
W25	Jumper	JPW-02A
W26	Jumper	JPW-02A
W27	Jumper	JPW-02A
W28	Jumper	JPW-02A
W29	Jumper	JPW-02A
W30	Jumper	JPW-02A
W31	Jumper	JPW-02A
W32	Jumper	JPW-02A
W33	Jumper	74/98/040/X98/X98
W34	Jumper	JPW-02A

FILTER UNIT/PA UNIT

REF. NO.	DESCRIPTION	PART NO.
W35	Jumper	JPW-02A
W36	Jumper	JPW-02H
W37	Jumper	74/98/050/X98/X98
W38	Jumper	74/98/050/X98/X98
W39	Jumper	JPW-02A
W40	Jumper	73/98/040/X98/X98
W41	Jumper	73/98/040/X98/X98

10 - 10 PA UNIT

REF. NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SC1971
Q2	Transistor	2SC3133
Q3	Transistor	2SC3133
Q4	Transistor	2SC2904
Q5	Transistor	2SC2904
Q6	Transistor	2SD880-Y
Q7	Transistor	2SC2120
Q8	Transistor	2SD468-C
Q9	Transistor	2SB562-C
Q10	Transistor	2SC2458-GR
Q11	Transistor	2SC3402
D1	Diode	MV5
D2	Diode	MV5
D3	Diode	1N4002
D4	Diode	U05G
D5	Diode	1SS53
D7	Diode	1SS53
D8	Diode	15CD11
D9	Diode	MV5
L1	Coil	LR-142
L2	Coil	FL4H 1R2M
L3	Coil	FL4H 1R2M
L4	Coil	LR-143
L5	Coil	FSQH050RN
L6	Coil	BT01RN1-A61
L7	Coil	FSQH050RN
L8	Coil	BT01RN1-A61
L9	Coil	LR-83
L10	Coil	LR-144
L11	Coil	LR-146
L12	Coil	FL5H 101K
L13	Coil	FSQH050RN
L14	Coil	BT01RN1-A61
L15	Coil	FSQH050RN
L16	Coil	BT01RN1-A61
L17	Coil	FSQH050RN
L19	Coil	FL5H 101K
L20	Coil	FL7H 102J
L21	Coil	FL7H 102J
L22	Coil	LR-151
L23	Coil	BT01RN1-A61
L24	Coil	BT01RN1-A61
L25	Coil	BT01RN1-A61
L26	Coil	BT01RN1-A61

PA UNIT

REF. NO.	DESCRIPTION	PART NO.
L27	Coil	BT01RN1-A61
L28	Coil	BT01RN1-A61
L29	Coil	BT01RN1-A61
L30	Coil	BT01RN1-A61
L31	Coil	BT01RN1-A61
L32	Coil	BT01RN1-A61
L33	Coil	BT01RN1-A61
L34	Coil	BT01RN1-A61
L35	Coil	BT01RN1-A61
L36	Coil	BT01RN1-A61
L37	Coil	BT01RN1-A61
L38	Coil	LAL04NA 102K
L39	Coil	LAL04NA 101K
L40	Coil	LW-22
L41	Coil	LAL04NA 101K
L42	Coil	BT01RN1-A61
L43	Coil	LAL04NA 100K
L44	Coil	LAL04NA 100K
R1	Resistor	220 R25
R2	Resistor	100 R25
R3	Resistor	470 R25
R4	Resistor	2.2 R25
R5	Resistor	4.7 R25
R6	Resistor	68 ELR25
R7	Resistor	22 ELR25
R8	Resistor	22 ELR25
R9	Resistor	68 ELR25
R10	Resistor	RSS1P3.3-J
R11	Resistor	RSS1P3.3-J
R12	Resistor	RSS1P3.3-J
R13	Resistor	RSS1P3.3-J
R14	Resistor	10 R50X
R15	Resistor	10 R50X
R16	Resistor	RSS1P3.3-J
R17	Resistor	RSS1P3.3-J
R18	Resistor	33k R25
R19	Resistor	1k R25
R20	Resistor	SQ5L0.012-J
R21	Resistor	1k R25
R22	Resistor	CRH200R-02J4R7 4.7
R23	Trimmer	RHB0CS21LA 470B
R24	Resistor	100 R50X
R25	Resistor	SRW1P0.1-J
R27	Trimmer	RHB0C1204A 100B
R28	Resistor	68 R50X
R29	Resistor	10 ELR25
R30	Resistor	1.8 ELR25
R31	Resistor	22 ELR25
R32	Resistor	100 R50X
R33	Resistor	2.2k ELR25
R34	Resistor	120 R50X
R35	Resistor	SRW3P60-J
R36	Resistor	4.7k ELR25
R37	Resistor	10k ELR20
R38	Resistor	1k ELR25
R39	Resistor	1k ELR25
R40	Resistor	4.7 ELR25
R41	Resistor	10k R20
R43	Resistor	47 ELR25

PA UNIT

REF. NO.	DESCRIPTION	PART NO.
R45	Absorber	DSA301LA
R46	Resistor	RSF1B220-J
R47	Resistor	330 ELR20
R48	Resistor	10 R50X
R49	Resistor	RSF2B15-J
C1	Ceramic	0.0022 50V
C2	Barrier Layer	UAT04V 122K 50V 0.0012
C3	Barrier Layer	0.1 16V
C4	Mylar	0.01 50V
C5	Mylar	0.01 50V
C6	Cylinder	100P 50V
C7	Monolithic	GR43CH471K 50V 470P
C8	Monolithic	GR44CH682K 50V 0.0068
C9	Monolithic	GR44CH682K 50V 0.0068
C10	Barrier Layer	560P 50V
C12	Monolithic	GR43CH471K 50V 470P
C13	Dip Mica	DM19C821J51CR 820P
C14	Monolithic	GR44CH102K 50V 0.001
C16	Ceramic	DD112 F 473Z 50V02
C17	Barrier Layer	0.047 25V
C18	Electrolytic	1000 16V MS16
C19	Monolithic	GR44Y5V684Z 25V 0.68
C20	Barrier Layer	0.047 25V
C21	Electrolytic	47 10V
C22	Electrolytic	10 16V
C23	Barrier Layer	0.047 25V
C24	Barrier Layer	0.047 25V
C25	Electrolytic	470 16V
C26	Barrier Layer	0.047 25V
C27	Electrolytic	10 16V
C28	Barrier Layer	0.1 16V
C29	Ceramic	0.0047 50V
C30	Barrier Layer	0.047 25V
C31	Barrier Layer	0.1 16V
C32	Barrier Layer	0.047 25V
C33	Barrier Layer	0.047 25V
C34	Electrolytic	10 16V
C35	Barrier Layer	0.047 25V
C36	Ceramic	DD112 F 473Z 50V02
C37	Barrier Layer	0.047 25V
C38	Barrier Layer	0.047 25V
C39	Barrier Layer	0.047 25V
C40	Barrier Layer	0.1 16V
C41	Ceramic	120P 50V
C42	Ceramic	20P 50V
C43	Ceramic	120P 50V
C44	Barrier Layer	0.047 25V
C45	Ceramic	220P 50V
C46	Feed Through	TF318-452E102GMV 50V
C47	Feed Through	TF318-452E102GMV 50V
C48	Feed Through	TF318-452E102GMV 50V
C49	Feed Through	TF318-452E102GMV 50V
C50	Barrier Layer	0.047 25V
C51	Barrier Layer	0.047 25V
C52	Barrier Layer	0.1 16V
C53	Ceramic	270P 500V
C54	Ceramic	270P 500V
C56	Tantalum	4.7 16V
C57	Tantalum	4.7 16V
C58	Barrier Layer	0.1 16V
C59	Ceramic	0.001 50V

PA UNIT

REF. NO.	DESCRIPTION	PART NO.
C60	Ceramic	0.001 50V
C61	Array	B8ZC0111-32N 0.0082x7
C62	Ceramic	0.0047 50V
RL1	Relay	UPM-12905Y
RL2	Relay	OMR-109F
J1	Connector	TL25P-12-V1
J2	Connector	TL25P-09-V1
J3	Connector	TL25P-03-V1
J4	Connector	TL25P-04-V1
J5	Connector	TL25P-05-V1
J6	Connector	TL B-P12H-B1
J7	Connector	HLJ4306-01-3080
J8	Connector	HSJ0805-01-020
J9	Connector	1625-24R
J10	Connector	TMP-J01X-V2
J11	Connector	FMMD-RM1
J12	Connector	KC21-0060
J13	Connector	LLR-6
P1	Connector	TMP-P01X-A1
P2	Connector	TMP-P01X-A1
P3	Connector	TL25H-05-B1
P4	Connector	TMP-P01X-A1
P5	Connector	TL25H-02-B1
P6	Connector	TL25H-04-B1
P7	Connector	1545R-1
F1	Fuse	3A
F2	Holder	TFH-S30
S1	Thermal	OHD-90M
S2	Thermal	OHD-50M
MF1	Motor	M6B 12U22
EP1	P.C. Board	B-702D
EP2	P.C. Board	B-720E
EP3	P.C. Board	B-721E
W1	Jumper	[62/99/280/C31/W13D
W2	Jumper	08 D]
W3	Jumper	[62/99/240/C31/W13D
W4	Jumper	08 D]
W5	Jumper	23/05/420/C01/D21
W6	Jumper	23/06/420/C01/D21
W7	Jumper	23/07/420/C01/D21
W8	Jumper	23/08/420/C01/D21
W9	Jumper	23/09/420/C01/D21
W10	Jumper	36/02/460/W03/W03
W11	Jumper	36/00/360/W03/W03
W12	Jumper	31/02/070/W07/W07
W13	Jumper	23/03/075/D21/W02
W14	Jumper	23/04/100/D21/W02
W15	Jumper	JPW-02A
W16	Jumper	JPW-02A
W17	Jumper	JPW-02A
W18	Jumper	JPW-02A
W19	Jumper	JPW-02A
W21	Jumper	JPW-02A
W22	Jumper	JPW-02A

PA UNIT/KEYER UNIT

REF. NO.	DESCRIPTION	PART NO.
W23	Jumper	72/98/010/X98/X98
W24	Jumper	72/98/010/X98/X98
W25	Jumper	72/98/010/X98/X98
W26	Jumper	72/98/010/X98/X98
W27	Jumper	72/98/010/x98/X98
W28	Jumper	72/98/010/X98/X98
W29	Jumper	72/98/010/X98/X98
W30	Jumper	72/98/010/X98/X98
W31	Jumper	72/98/010/X98/X98
W32	Jumper	72/98/010/X98/X98
W33	Jumper	72/98/010/X98/X98
W34	Jumper	72/98/010/X98/X98
W35	Jumper	73/98/070/X98/X98
W36	Jumper	[61/99/400/C31/W13A
W37	Jumper	99 A A]
W38	Jumper	[61/99/490/C01/W13A
W39	Jumper	99 A A]
W40	Jumper	23/00/400/C01/D21
W41	Jumper	23/01/450/C01/D21
W42	Jumper	23/02/400/C01/D21
W43	Jumper	23/03/400/C01/D21
W44	Jumper	JPW-02A
W45	Jumper	JPW-02A
W47	Jumper	JPW-02A
W48	Jumper	23/08/090/C22/A04
W49	Jumper	23/09/090/C22/A04
W50	Jumper	23/00/090/C22/A04
W51	Jumper	23/01/090/C22/A04
W52	Jumper	[51/02/090/C22/A04
W53	Jumper	08 A A]
W54	Jumper	23/04/090/C22/A04
W55	Jumper	23/05/090/C22/A04
W56	Jumper	23/06/090/C22/A04
W57	Jumper	23/07/090/C22/A04
W58	Jumper	23/08/090/C22/A04
W59	Jumper	23/09/090/C22/A04
W60	Jumper	31/02/130/D21/W02
W62	Jumper	JPW-02A
W66	Jumper	35/02/055/B03/W04
W67	Jumper	35/02/055/B03/W04
W68	Jumper	35/00/040/B03/W04
W69	Jumper	35/00/040/B03/W04
W70	Jumper	13/02/420/B03/A08
W71	Jumper	13/00/420/B03/A08
W72	Jumper	13/02/170/W02/X99
W73	Jumper	JPW-02A
W74	Jumper	74/98/020/X98/X98
W75	Jumper	74/98/020/X98/X98

10 - 11 KEYER UNIT

REF. NO.	DESCRIPTION	PART NO.
IC1	IC	μPD7564 CS031
Q1	Transistor	2SC3399
Q2	Transistor	2SB562 C
D1	Zener	RD5.1E B2

KEYER UNIT/MUTE UNIT

REF. NO.	DESCRIPTION	PART NO.
X1	Ceramic Resonator	CSB500E
R1	Resistor	4.7k R20
R2	Resistor	4.7k R20
R3	Resistor	1k R20
R4	Resistor	22k R20
R5	Resistor	560 R20
R6	Resistor	3.3k R20
R7	Resistor	6.8k R20
R8	Trimmer	RHB0CS42BA 47k
R9	Resistor	10k ELR25
R10	Resistor	10k R25
R11	Resistor	150 R25
R12	Resistor	220 R50X
C1	Mylar	0.047 50V
C2	Mylar	0.01 50V
C3	Ceramic	0.0047 50V
C4	Electrolytic	10 16V MS7
C5	Ceramic	100P 50V
C6	Ceramic	100P 50V
C7	Electrolytic	2.2 50V MS7
C8	Ceramic	0.0047 50V
C9	Electrolytic	100 16V
C10	Ceramic	0.0047 50V
J1	Connector	TL25P-03-V1
J2	Connector	TL25P-04-V1
J3	Connector	TL25P-03-V1
J4	Connector	TL25P-03-V1
EP1	P.C.Board	B-1134B
W1	Jumper	IPS-1041-2
W2	Jumper	IPS-1041-2
W3	Jumper	IPS-1041-2
W4	Jumper	IPS-1041-2

10 - 12 MUTE UNIT (AUSTRALIA, FRANCE VERSIONS)

REF. NO.	DESCRIPTION	PART NO.
Q1	Transistor	2SC3395
Q2	Transistor	2SC2412K BS
R1	Chip	47k MCR10
R2	Chip	10k MCR10
R3	Chip	100k MCR10
EP1	P.C.Board	B-1037A
W1	Jumper	JPW-02A
W2	Jumper	JPW-02A
W3	Jumper	71/98/005/X98/X98
W4	Jumper	71/98/005/X98/X98
W5	Jumper	71/98/005/X98/X98

SECTION 11 OPTIONS INSTALLATION

WARNING: Disconnect the power cable from the IC-751A before performing any work.

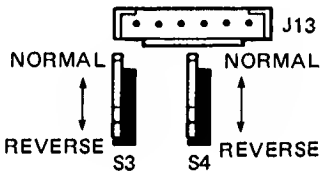
11 - 1 OPTIONAL FILTERS

• FILTER REVERSE SWITCHES

The [FILTER] SWITCH on the front panel of the IC-751A selects two receive filter systems for SSB, CW, RTTY or AM mode when it is switched to either the IN or OUT position. The IN/OUT relationship of the [FILTER] SWITCH may be reversed by using the internal FILTER REVERSE SWITCHES on the MAIN UNIT.

S3: Reverses the IN and OUT positions of the [FILTER] SWITCH when using AM mode.

S4: Reverses the IN and OUT positions of the [FILTER] SWITCH when using CW or RTTY mode.



(1) FL-52A, FL-53A FILTER INSTALLATION

These are 455kHz filters for use with CW NARROW or RTTY NARROW mode.

No special tools are required to successfully complete the installation of these filters. Install them at position [F] in the photo on p.11-5.

1) First, remove the top cover.

2) Insert the optional FL-52A or FL-53A into position [F] as shown in the photo on p.11-5.

3) Check the operation of the filter using the FILTER COMBINATIONS TABLE for a guide (p.11-5).

(2) FL-63A FILTER INSTALLATION

This is a 9MHz narrow filter for CW or RTTY mode. The filter replaces the standard FL-32A which is supplied with the IC-751A. Install this filter at [A] position as shown on p.11-5.

1) Remove the transceiver top cover, then the 11 screws from the MAIN UNIT.

2) Lift the right edge of the MAIN UNIT upwards taking care not to damage the sockets and plugs that are installed on the unit.

3) The filter must be installed at position [A] in the photo as shown on p.11-5.
Remove the FL-32A original filter from the MAIN UNIT using a de-soldering braid.

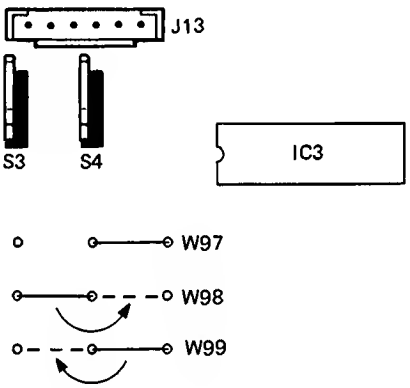
4) Install the FL-63A at position [A]. Orient the label on the filter in the same manner as the other filters already installed.

5) Bend the leads and mounting tabs flush against the opposite side of the printed circuit board, and solder. Trim the ends of the leads with diagonal cutters.

6) Replace the MAIN UNIT and screws, and the top cover.

There are no adjustments required after installation is completed.

(3) FL-70 FILTER INSTALLATION



The FL-70 is a 9MHz wide filter for SSB mode which may be installed for either of the following two reasons:
a) To replace the standard FL-80.
b) To replace the standard FL-32A.

a: Use the FL-63A installation method given previously. Place the FL-70 in the position where the FL-80 is now installed.

b: 1) Use the FL-63A installation method given previously. Place the FL-70 in the position where the FL-32A is now installed.

2) The FL-70 operates only in CW or RTTY mode if it is installed in the FL-32A location.

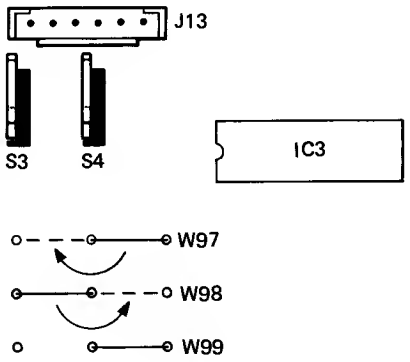
Therefore, perform the following modification so the FL-70 may or may not be used as desired.

3) W98 and W99 jumper wires on the MAIN UNIT must be changed as shown in the diagram above.

4) The FL-70 and FI14 (CFJ-455K5) can now be selected by pushing the [FILTER] SWITCH on the front panel IN. The receive bandwidth will be 2.8kHz.

FL-80 and FL-44A can be selected by placing the [FILTER] SWITCH in the OUT position. The bandwidth will then be 2.3kHz.

(4) FL-33 INSTALLATION



This is a 9MHz filter for AM mode. FL-33 replaces FL-32A and requires the relocation of jumper wires.

1) Use the FL-63A installation method given previously. Install FL-33 where FL-32A is now installed.

2) Change the jumper wires as shown in the diagram above.

3) This installation causes FL-33 to be selected whether the [FILTER] SWITCH is in the IN or OUT position when using AM mode. Only 455kHz filters will be changed by the [FILTER] SWITCH.

11 - 2 OPTIONAL IC-PS35 INTERNAL POWER SUPPLY

WARNING: Disconnect the power cable from the IC-751A before performing any work.

- **INSTALLATION**

Refer to diagrams at right.

1) Turn the transceiver upside down. Remove PLATE (A) attached to the rear panel by unscrewing the four screws. These screws will be used later.

2) Attach the IC-PS35 INTERNAL POWER SUPPLY to the bottom cover with the supplied screws and insulating washers. Also insert the insulating gasket between the IC-PS35 and the bottom cover.

3) The IC-PS35 comes with an AC POWER SOCKET PLATE.
Pass the DC power cable attached to P1 through the hole on the AC POWER SOCKET PLATE then insert the bushing into the hole.
Exchange the AC POWER SOCKET PLATE at the PLATE (A) position using the screws which previously held PLATE (A). The AC POWER SOCKET should be near the bottom of the transceiver.

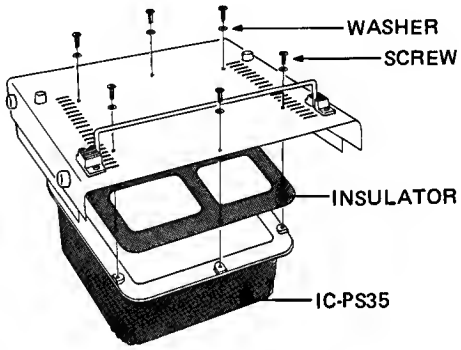
4) Pass the P2' connector from the AC POWER SOCKET unit to the inner chassis through the hole in the rear chassis. Connect P2' with the P2 connector from the IC-PS35.

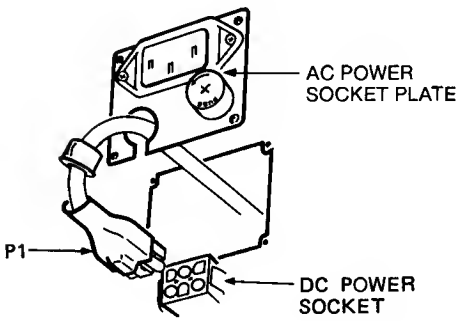
5) Position the cables in the rear chassis. This prevents magnetic coupling between the cables and the VCO coil cores.

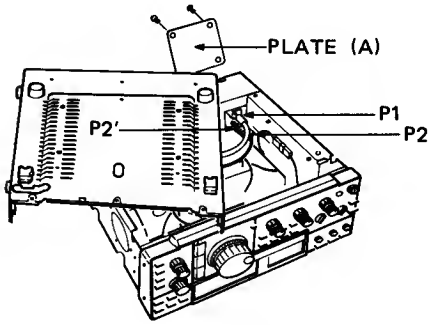
6) Replace the top and bottom covers of the transceiver. Plug P1 from the IC-PS35 into the DC POWER SOCKET on the transceiver.

7) Connect the supplied AC power cable into the newly installed AC POWER SOCKET on the rear panel of the IC-751A. Connect the AC power plug into an AC power outlet.

8) Push the IC-751A [POWER] SWITCH to apply power to the transceiver.





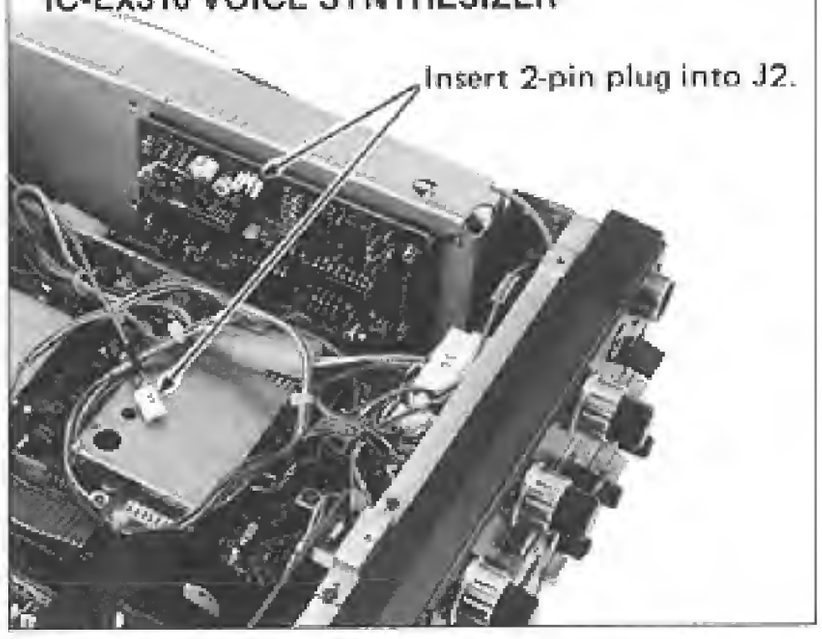


11 - 3 OPTIONAL IC-EX310 VOICE SYNTHESIZER UNIT

After installation the voice synthesizer announces the displayed frequency when the [SPEECH] SWITCH on the front panel is pushed.

- **INSTALLATION**

IC-EX310 VOICE SYNTHESIZER



1) Turn the transceiver upside down.

2) Install the IC-EX310 unit in the position on the chassis as shown in the photo above using the four supplied screws. Insert the 2-pin plug into J2 on the IC-EX310 unit.

3) Plug the 8-pin plug from the IC-EX310 unit into J12 on the LOGIC UNIT. See photo below for the position of J12 on the LOGIC UNIT.

LOGIC UNIT

4) Adjust the volume and speech speed if necessary. The procedure is described below.

5) Replace the top and bottom covers on the IC-751A.

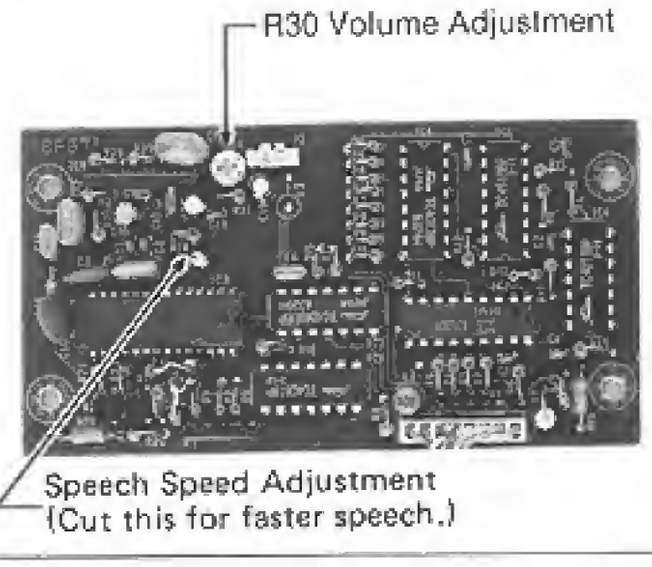
- **ADJUSTMENT**

1) Adjust the speech volume and speech speed, if necessary, before the top and bottom covers are replaced.

2) Connect a power source to the transceiver and push IN the [POWER] SWITCH. Push the [SPEECH] SWITCH on the front panel to have the displayed frequency announced in English.

3) The volume of the announcement is adjustable with R16 on the voice synthesizer unit. Adjust R30 to a comfortable audio level.

IC-EX310 VOICE SYNTHESIZER UNIT



4) The W1 jumper wire controls the speech speed. Cut W1 to increase the speech speed.

5) Replace the top and bottom covers of the transceiver when adjustments are completed.

11 - 4 OPTIONAL CR-64 HIGH-STABILITY CRYSTAL UNIT

- **INSTALLATION**

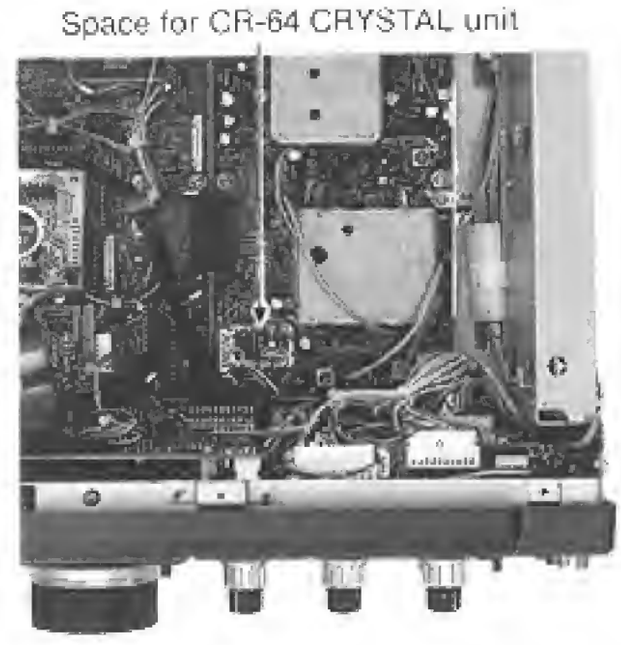
1) Turn the transceiver upside down.

2) Unscrew the six screws on the PLL UNIT. Unplug all connectors then turn the unit over to view the printed circuit side shown on p.11-5.

3) Use a de-soldering braid to remove solder from the original crystal unit terminals and grounding lead. Remove the original crystal unit and grounding lead from the PLL UNIT.

4) The mounting location for the high-stability crystal unit is shown in the photo below. The holes for the unit terminals are predrilled. If the holes are filled with solder, remove the solder using a desoldering braid.

PLL UNIT



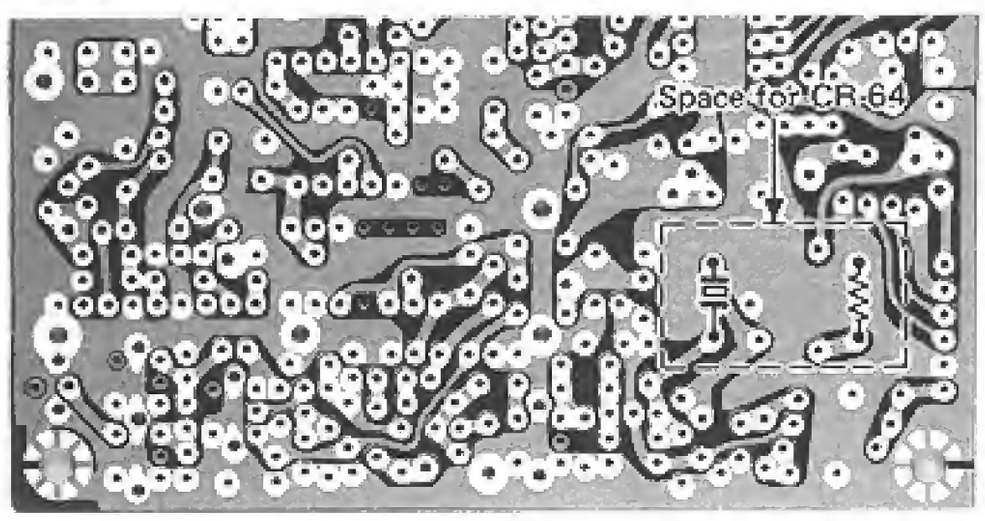
5) Orient the unit so that the crystal and heater terminals are inserted into the correct holes as indicated in the photo below. The terminals are labelled on the bottom of the unit.

   Position the crystal unit flush with the PLL P.C.Board and bend the leads against the foil on the board and solder.

6) Trim the terminals even with the solder points.

7) Replace the PLL P.C. Board and re-install the connectors. Replace the top and bottom covers of the transceiver.

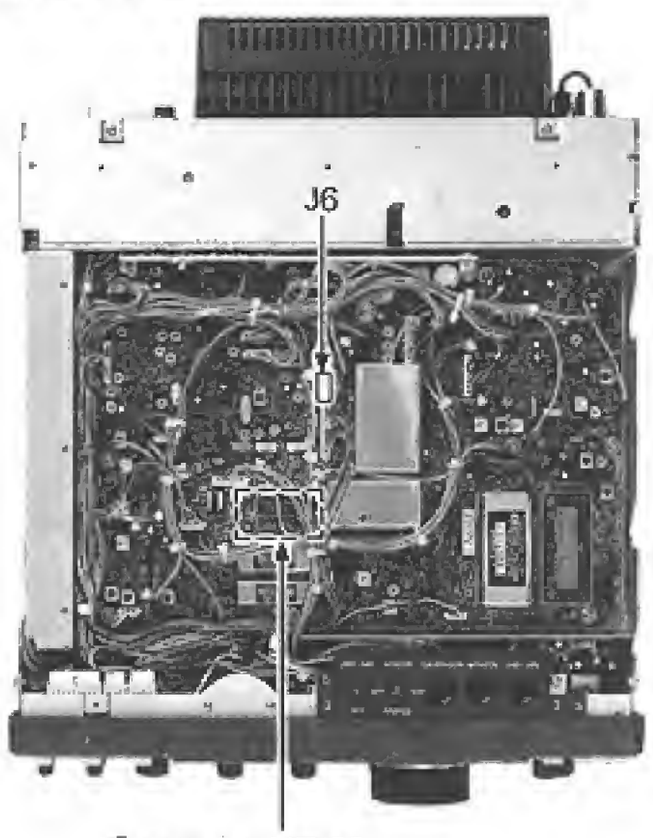
PLL P.C. BOARD



11 - 5 OPTIONAL UT-30 PROGRAMMABLE ENCODER UNIT

• INSTALLATION

MAIN UNIT Side



Space for UT-30

1) Remove the transceiver top cover.

2) Install the UT-30 where IC3 is located on the MAIN UNIT using the supplied doublesided tape.

3) Plug the 3-pin connector from the UT-30 into J6 on the MAIN UNIT.

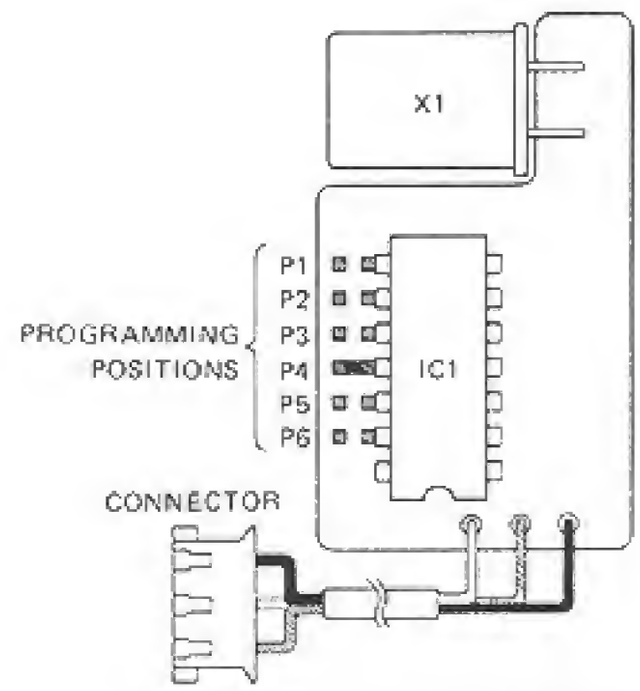
4) Program the UT-30 for the frequency required using the programming chart below. The UT-30 is factory programmed at 88.5Hz.

5) Replace the transceiver cover.

NOTE: Install and solder a jumper wire in each position indicated by "1" in the table below.

SUBAUDIBLE TONE ENCODER PROGRAMMING CHART

FRE-QUENCY	P1	P2	P3	P4	P5	P6		FRE-QUENCY	P1	P2	P3	P4	P5	P6
67.0	1							131.8			1		1	
71.9		1						136.5	1		1		1	
74.4	1	1						141.3		1	1		1	
77.0			1					146.2	1	1	1		1	
79.7	1		1					151.4				1	1	
82.5		1	1					156.7	1			1	1	
85.4	1	1	1					162.2		1		1	1	
88.5				1				167.9	1	1		1	1	
91.5	1			1				173.8			1	1	1	
94.8		1		1				179.9	1		1	1	1	
97.4	1	1		1				186.2		1	1	1	1	
100.0			1	1				192.8	1	1	1	1	1	
103.5	1		1	1				203.5						1
107.2		1	1	1				210.7	1					1
110.9	1	1	1	1				218.1		1				1
114.8					1			225.7	1	1				1
118.8	1				1			233.6			1			1
123.0		1			1			241.8	1		1			1
127.3	1	1			1			250.3		1	1			1



● Above unit is programmed for an 88.5Hz tone at the factory.

• FILTER CHARACTERISTICS

MODE	FILTER	CHARACTERISTICS		
		Center Frequency	−6dB point	−60dB point
CW/RTTY	FL-52A	455kHz	500Hz	1kHz
CW/RTTY	FL-53A	455kHz	250Hz	480Hz
CW/RTTY	FL-63A	9.0106MHz	250Hz	800Hz
CW/RTTY	*FL-32A	9.0106MHz	500Hz	1.34kHz
SSB	FL-70	9.0115MHz	2.8kHz	5kHz
SSB	*FL-80	9.0115MHz	2.6kHz	3.8kHz
SSB	*FL-44A	455kHz	2.3kHz	4.2kHz
AM	FL-33	9.0100MHz	6kHz	20kHz

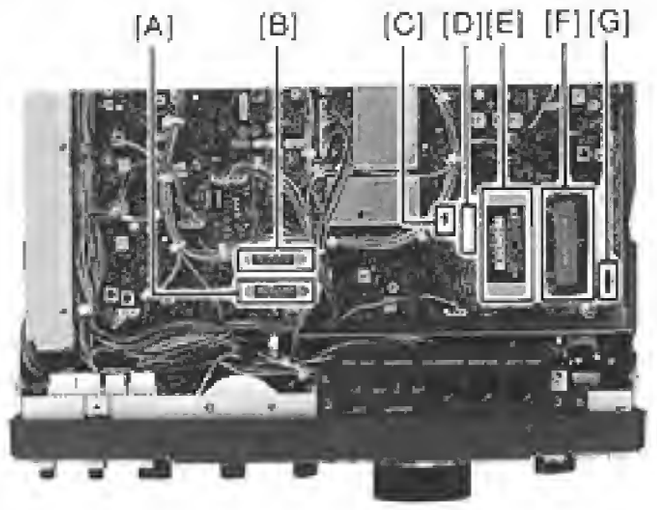
NOTE: The filters marked with "*" are supplied with the IC-751A.

• FILTER COMBINATIONS

MODE	FILTER SWITCH	9MHz FILTER	455kHz FILTER	STANDARD BANDWIDTH	P.B.T.
USB/LSB	OUT	FL-80	FL-44A	2.3kHz	YES
	IN	FL-80	CFJ455K5	2.6kHz	YES
CW/RTTY	OUT	FL-32A	FL-44A	500Hz	YES
	IN	FL-80	FL-44A	2.3kHz	YES
CW/RTTY NARROW	OUT	FL-32A	FL-52A/ FL-53A	500Hz/ 250Hz	YES
	IN	FL-80	FL-52A/ FL-53A	500Hz/ 250Hz	IF SHIFT
AM	OUT	THROUGH	CFW455HT	8kHz	NO
	IN	THROUGH	CFJ455K5	3kHz	NO
FM	OUT	THROUGH	CFW455E	15kHz	NO
	IN	THROUGH	CFW455E	15kHz	NO

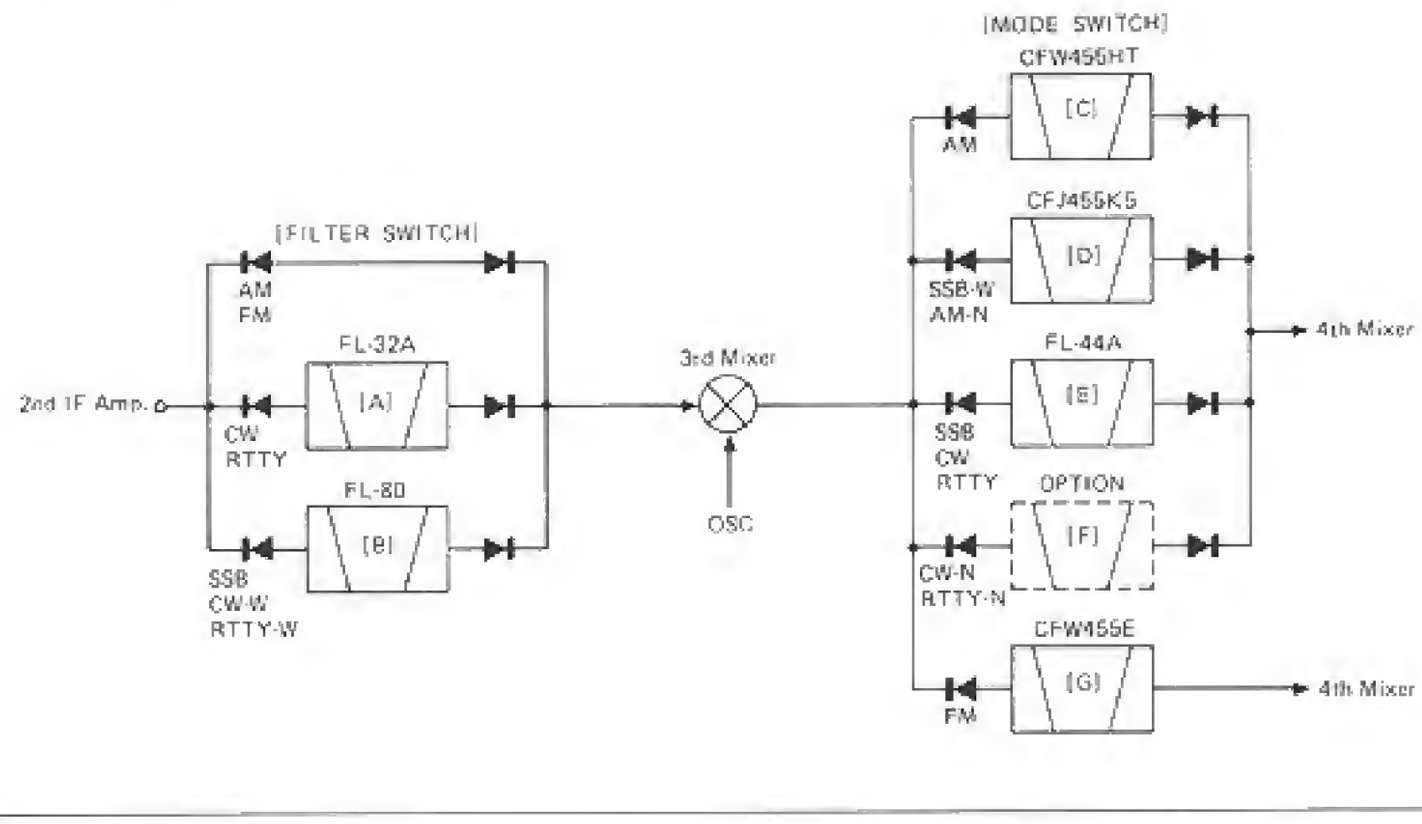
• FILTER SYSTEM

Bracketed numbers indicate filters shown in diagram below.

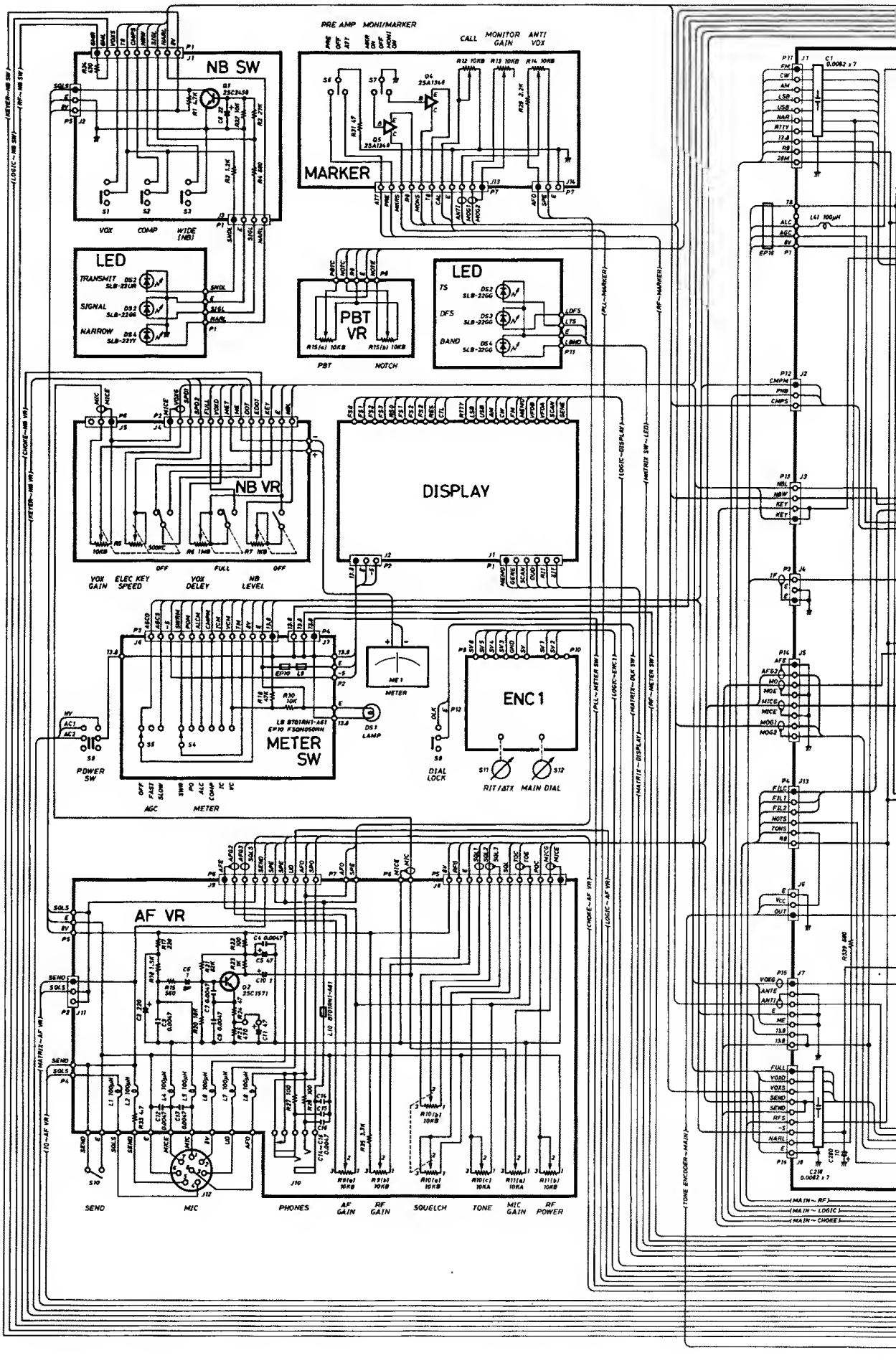


See pages 11-1~4 for installation instructions.

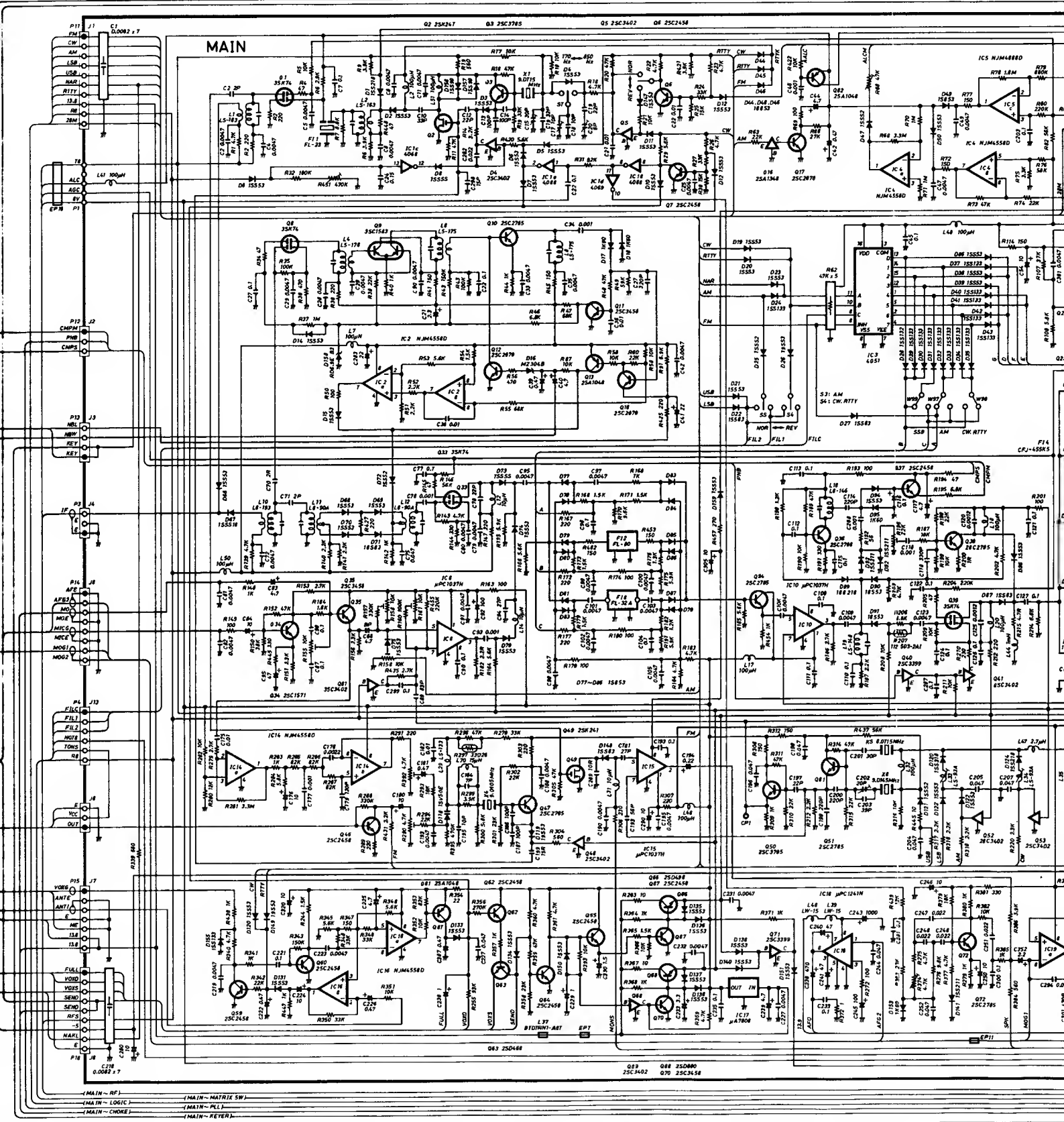
FILTERS

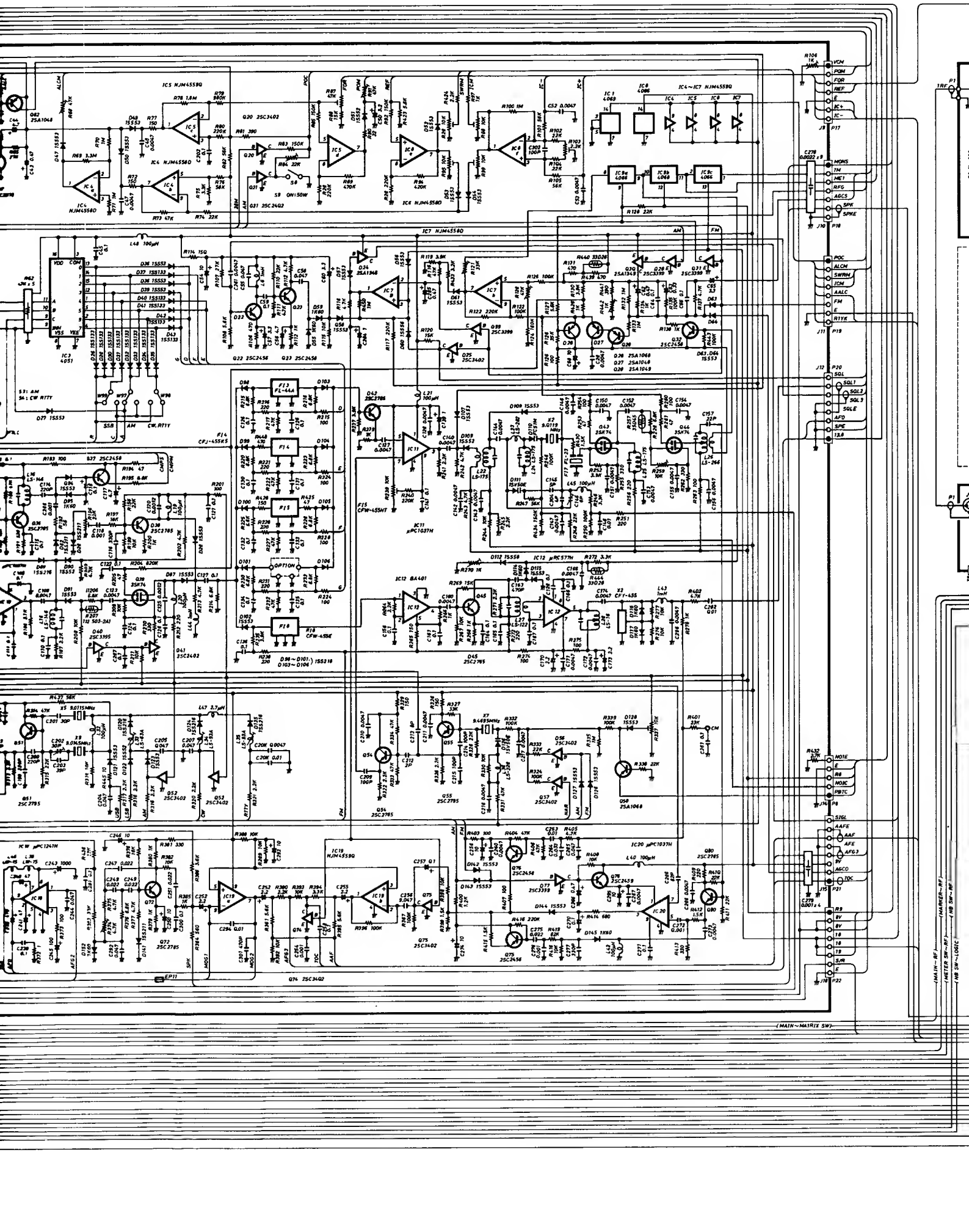


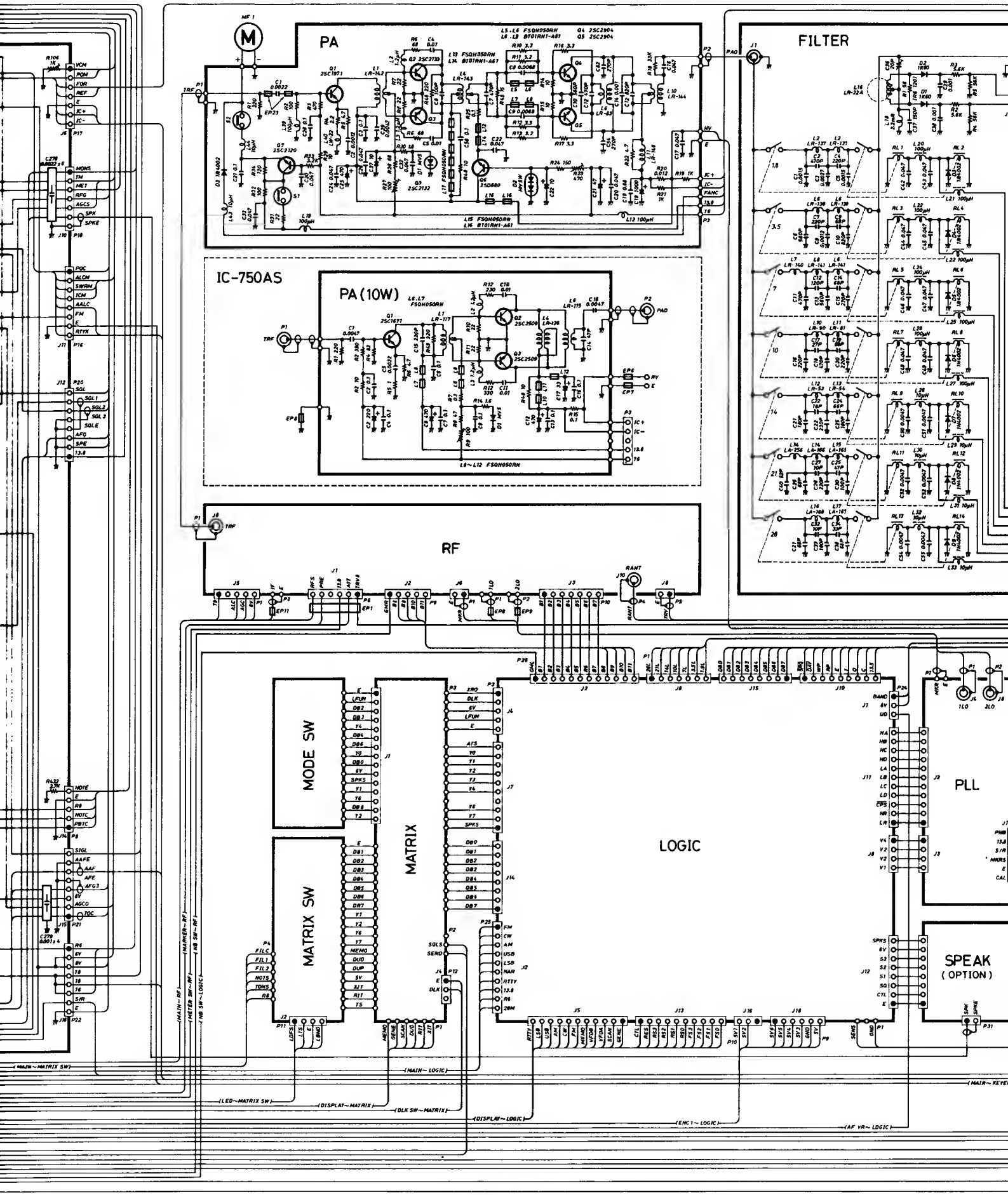
IC-751A SCHEMATIC DI



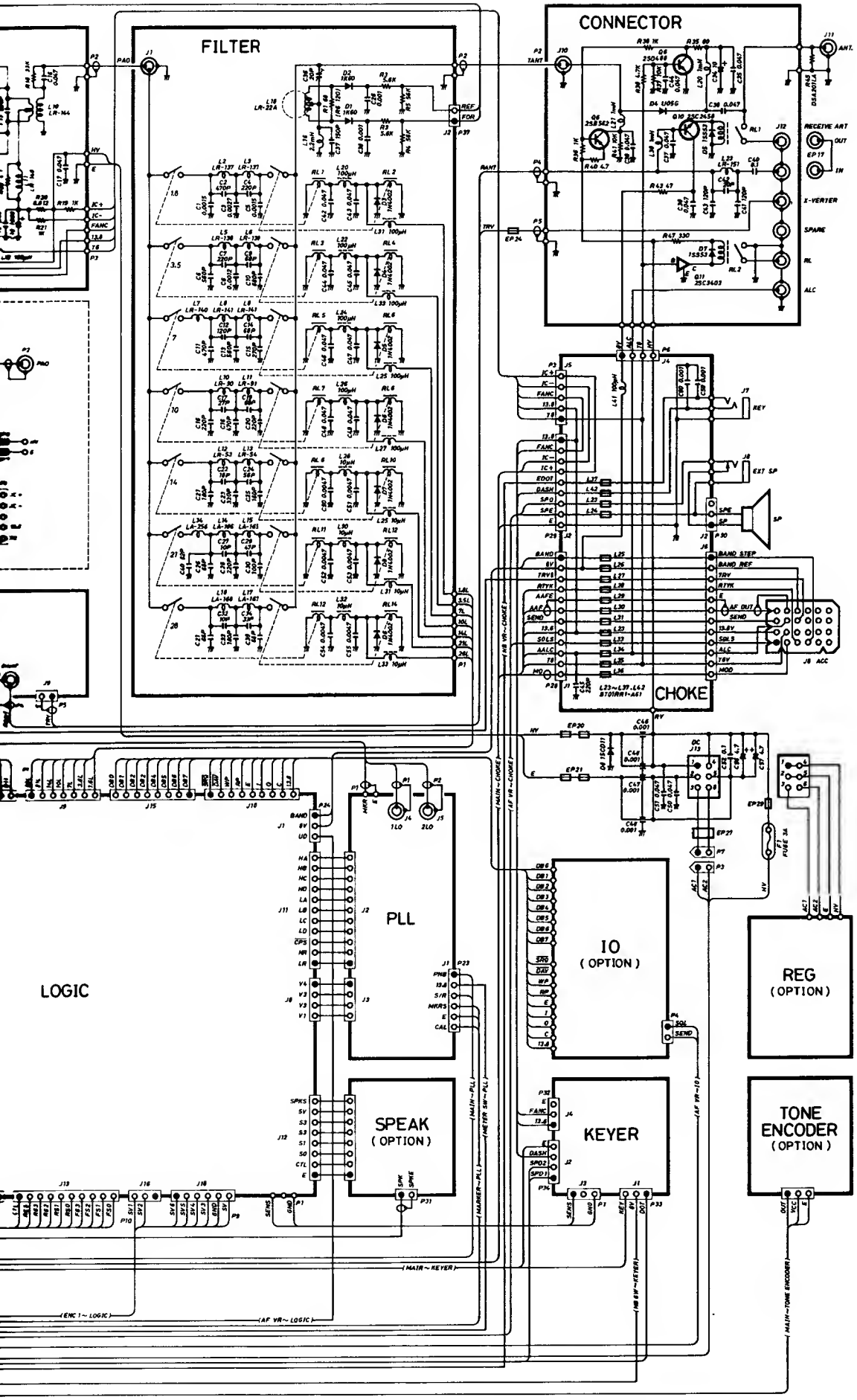
TIC DIAGRAM


MAIN
(MAIN~ RF)
(MAIN~ LOGIC)
(MAIN~ CHOKE)
(MAIN~ MATRIX SW)
(MAIN~ PLL)
(MAIN~ KEYER)





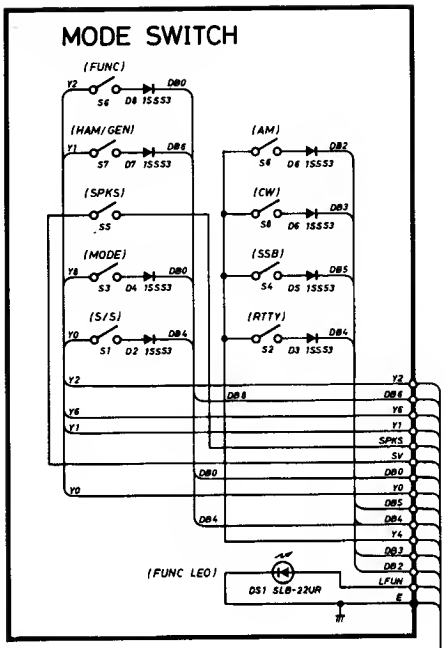
ICOM INCORPORATED

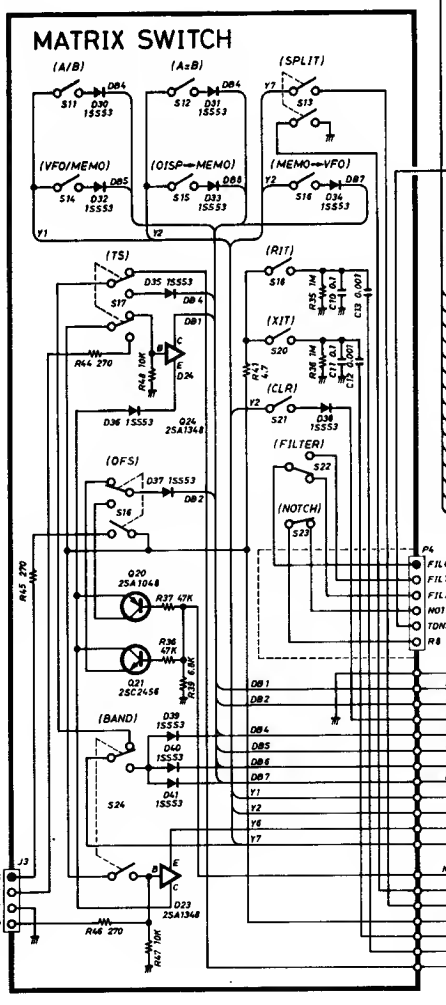


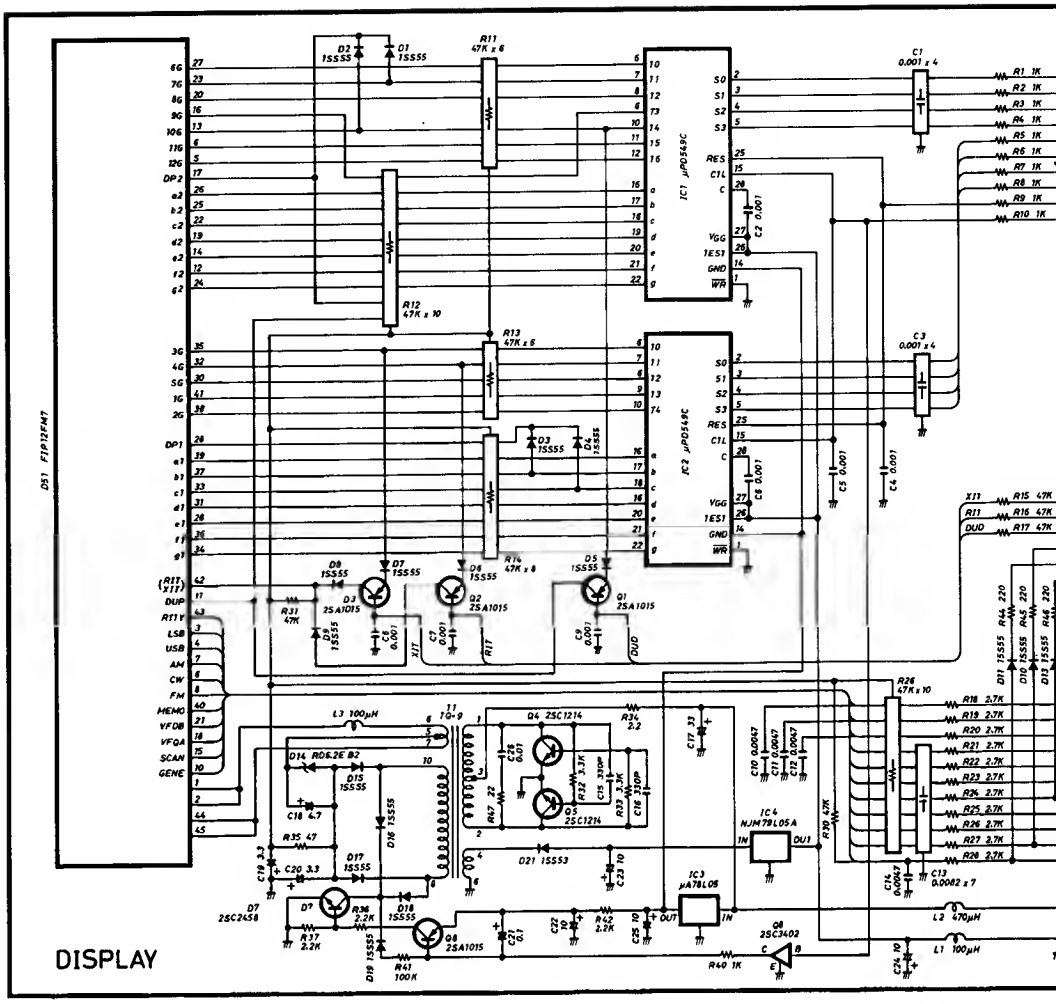
ICOM INCORPORATED

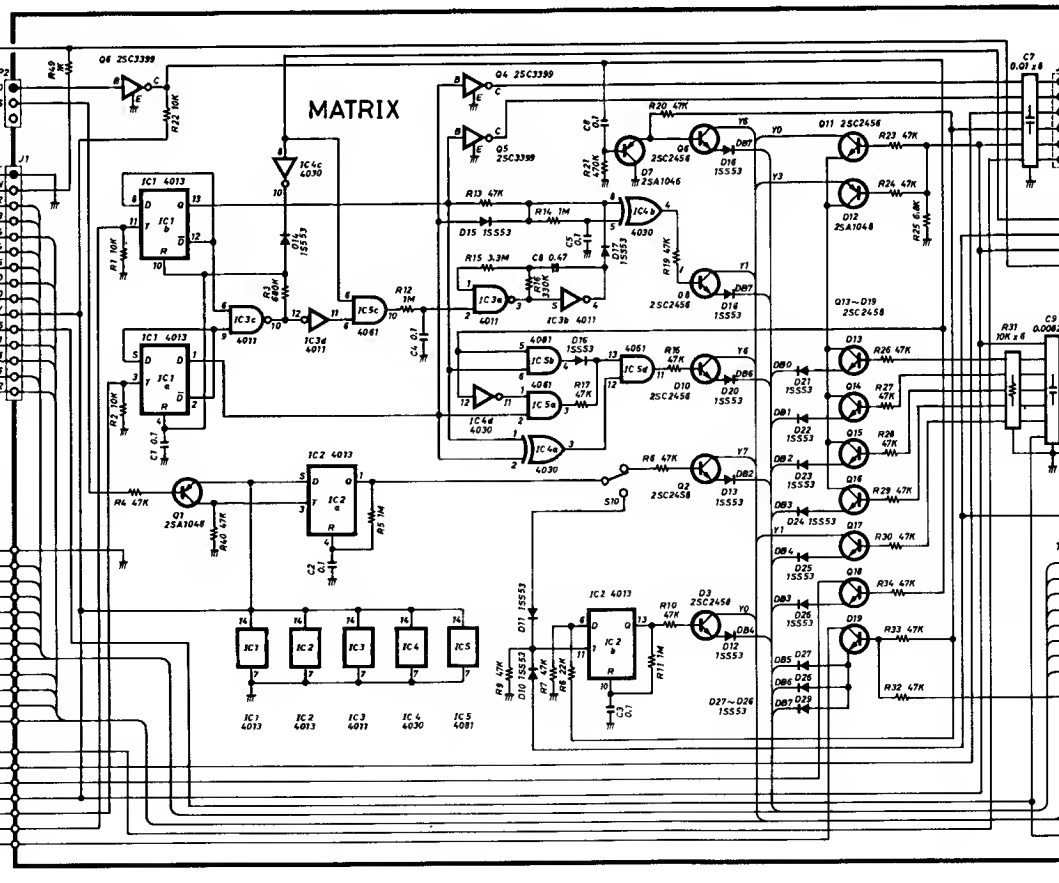
To upgrade quality, some components may be subject to change without notice.

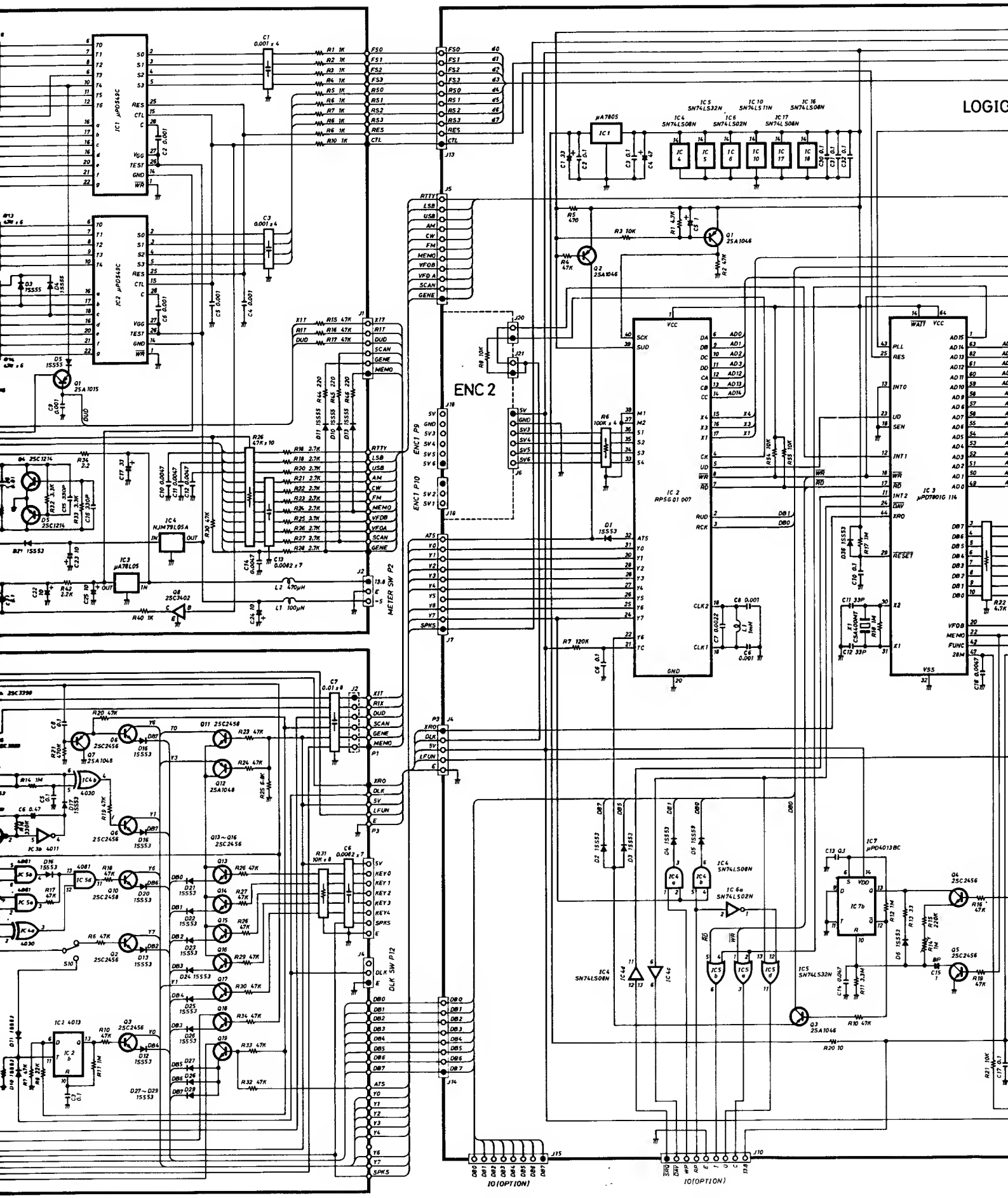
A-0750

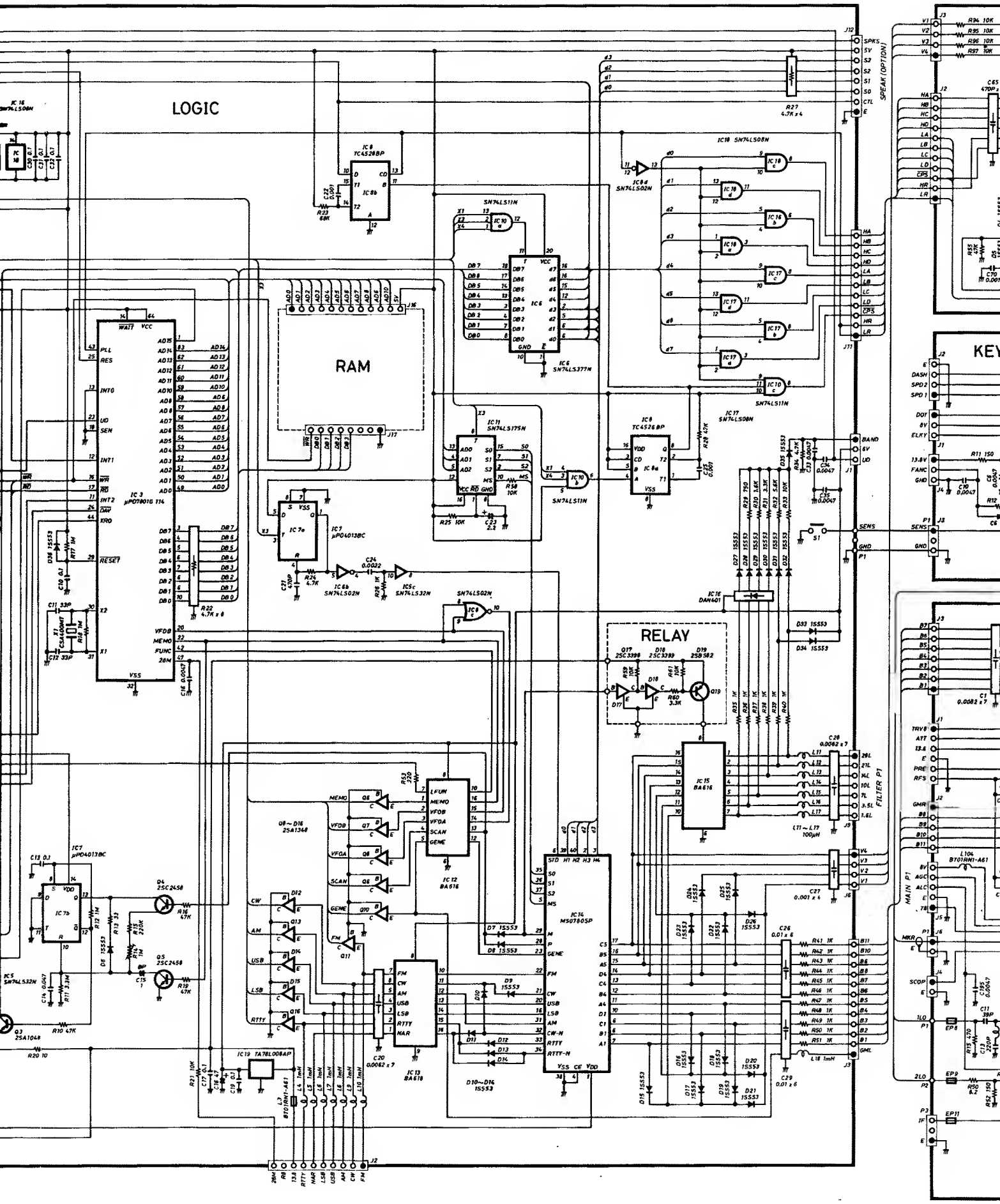

MODE SWITCH
(FUNC)
(HAM/GEN)
(AM)
(SPKS)
(CW)
(MODE)
(SSB)
(S/S)
(RTTY)
(FUNC LED)
DS1 SLR-22UR

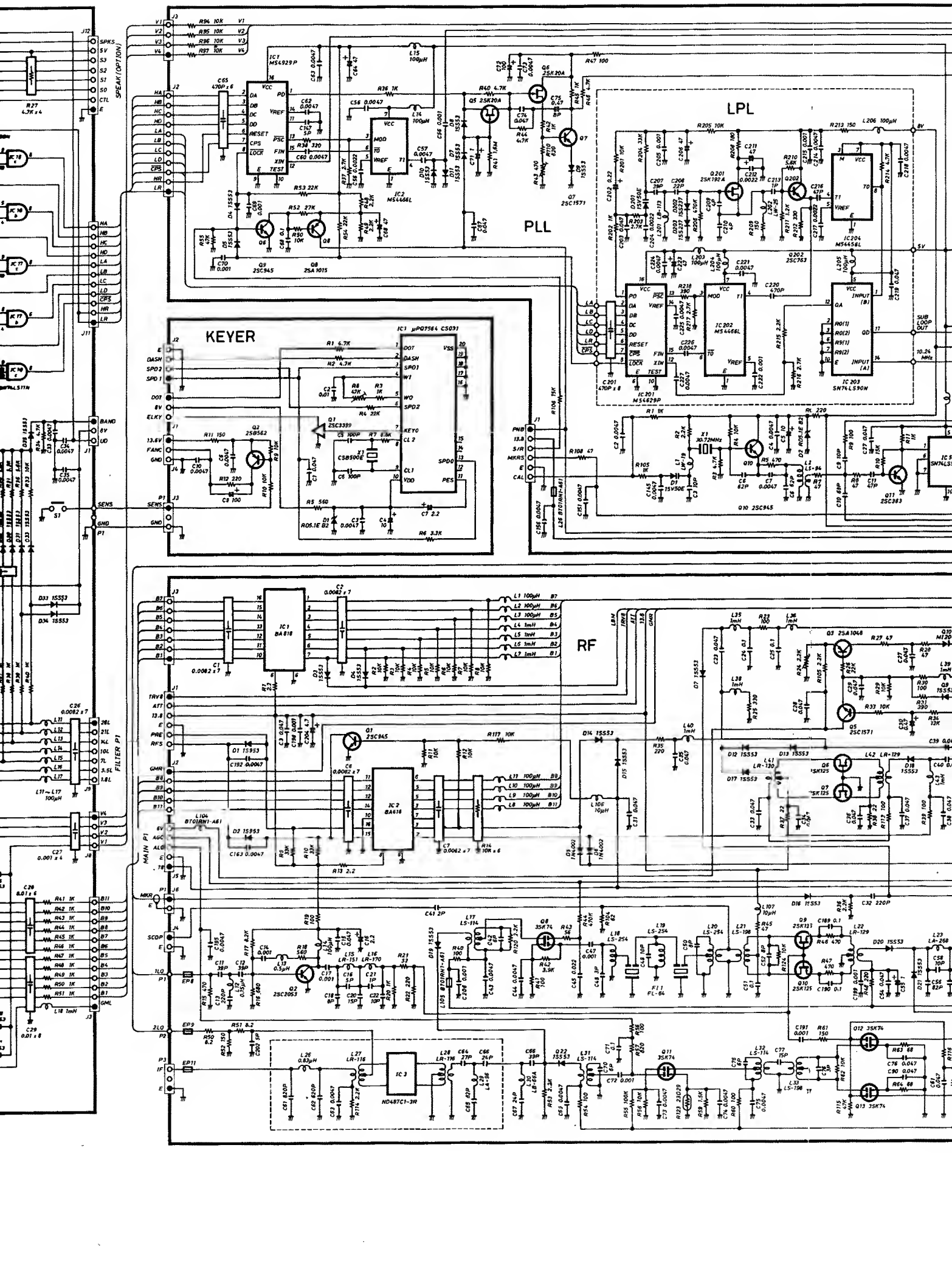

MATRIX SWITCH
(A/B)
(A=B)
(SPLIT)
(VFO/MEMO)
(OISP→MEMO)
(MEMO→VFO)
(TS)
(RIT)
(XIT)
(CLR)
(OFS)
(FILTER)
(NOTCH)
(BAND)
LED P11

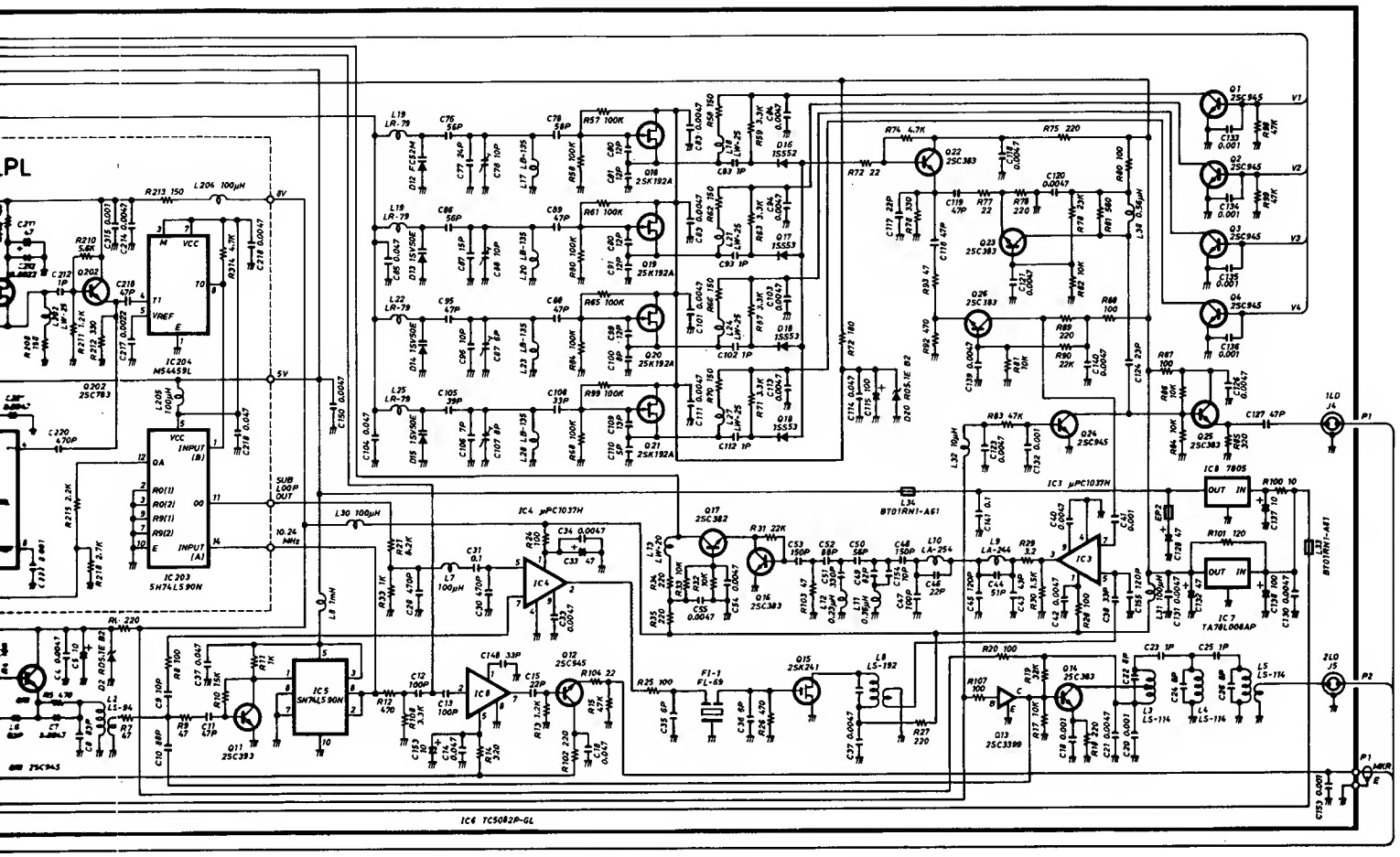

DISPLAY
DS1 FIP12M47
IC1 μPD546C
IC2 μPD546C
IC4 NJM78L05A
IC3 μA78L05

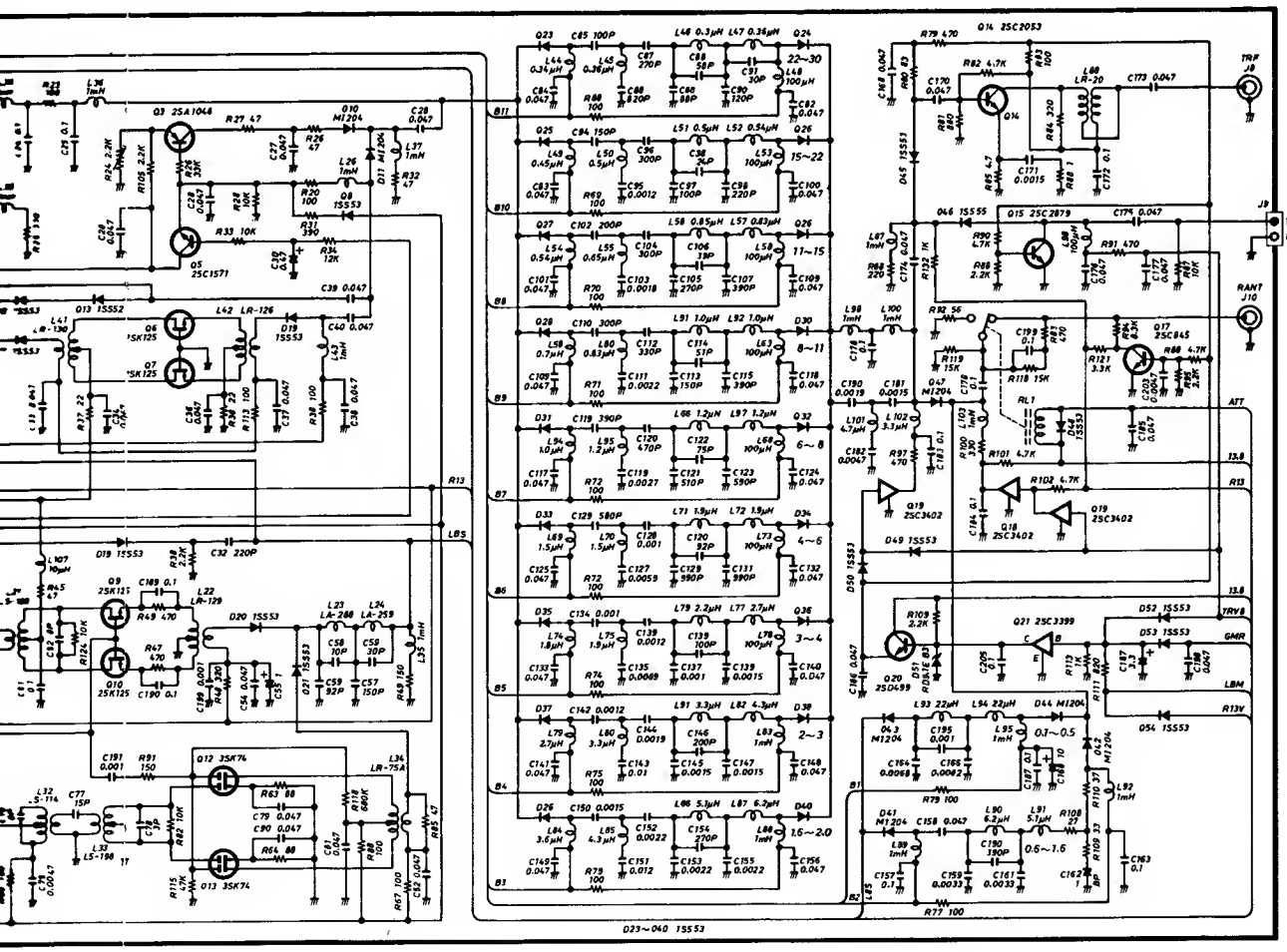

MATRIX
MAIN J13
AF VR J11


LOGIC
ENC 2
ENC1 P9
ENC1 P10
METER SW P2
DLK SW P12
IO(OPTION)
IO(OPTION)
IC 1 μPD546C
IC 2 μPD546C
IC 2 RPSG 01 007
IC 3 μPD7801G 114
IC 4 NJM79L05A
IC 3 μA78L05
μA7805
IC 5 SN74LS32N
IC 10 SN74LS11N
IC 16 SN74LS08N
IC4 SN74LS08N
IC6 SN74LS02N
IC7 μPD4013BC
Q1 2SA1015
Q1 2SA1046
Q2 2SA1046
Q3 2SA1046
Q6 2SC3402
Q7 2SA1048
Q8 2SC1214
Q9 2SC1214
Q10 2SC2458
Q11 2SC2458
Q12 2SA1048
Q13~Q16 2SC2456
Q1 2SC2456
Q2 2SC2456
Q3 2SC2456
Q4 2SC2456
Q5 2SC2456
Q6 2SC2456
Q7 2SC2456
D1 1SS53
D2 1SS53
D3 1SS53
D4 1SS53
D5 1SS53
D6 1SS53
D7 1SS53
D8 1SS53
D9 1SS53
D10 1SS55
D11 1SS55
D12 1SS53
D13 1SS53
D14 1SS55
D15 1SS53
D16 1SS53
D17 1SS53
D18 1SS53
D19 1SS53
D20 1SS53
D21 1SS53
D22 1SS53
D23 1SS53
D24 1SS53
D25 1SS53
D26 1SS53
D27~D29 1SS53
D30 1SS53
D31 1SS53
D32 1SS53
D33 1SS53
D34 1SS53
D35 1SS53
D36 1SS53
D37 1SS53
D38 1SS53
D39 1SS53
D40 1SS53
D41 1SS53
D42 1SS53
D43 1SS53
D44 1SS53
D45 1SS53
D46 1SS53
D47 1SS53
D48 1SS53
D49 1SS53
D50 1SS53
D51 1SS53
D52 1SS53
D53 1SS53
D54 1SS53
D55 1SS53
D56 1SS53
D57 1SS53
D58 1SS53
D59 1SS53
D60 1SS53
D61 1SS53
D62 1SS53
D63 1SS53
D64 1SS53
D65 1SS53
D66 1SS53
D67 1SS53
D68 1SS53
D69 1SS53
D70 1SS53
D71 1SS53
D72 1SS53
D73 1SS53
D74 1SS53
D75 1SS53
D76 1SS53
D77 1SS53
D78 1SS53
D79 1SS53
D80 1SS53
D81 1SS53
D82 1SS53
D83 1SS53
D84 1SS53
D85 1SS53
D86 1SS53
D87 1SS53
D88 1SS53
D89 1SS53
D90 1SS53
D91 1SS53
D92 1SS53
D93 1SS53
D94 1SS53
D95 1SS53
D96 1SS53
D97 1SS53
D98 1SS53
D99 1SS53
D100 1SS53
D101 1SS53
D102 1SS53
D103 1SS53
D104 1SS53
D105 1SS53
D106 1SS53
D107 1SS53
D108 1SS53
D109 1SS53
D110 1SS53
D111 1SS53
D112 1SS53
D113 1SS53
D114 1SS53
D115 1SS53
D116 1SS53
D117 1SS53
D118 1SS53
D119 1SS53
D120 1SS53
D121 1SS53
D122 1SS53
D123 1SS53
D124 1SS53
D125 1SS53
D126 1SS53
D127 1SS53
D128 1SS53
D129 1SS53
D130 1SS53
D131 1SS53
D132 1SS53
D133 1SS53
D134 1SS53
D135 1SS53
D136 1SS53
D137 1SS53
D138 1SS53
D139 1SS53
D140 1SS53
D141 1SS53
D142 1SS53
D143 1SS53
D144 1SS53
D145 1SS53
D146 1SS53
D147 1SS53
D148 1SS53
D149 1SS53
D150 1SS53
D151 1SS53
D152 1SS53
D153 1SS53
D154 1SS53
D155 1SS53
D156 1SS53
D157 1SS53
D158 1SS53
D159 1SS53
D160 1SS53
D161 1SS53
D162 1SS53
D163 1SS53
D164 1SS53
D165 1SS53
D166 1SS53
D167 1SS53
D168 1SS53
D169 1SS53
D170 1SS53
D171 1SS53
D172 1SS53
D173 1SS53
D174 1SS53
D175 1SS53
D176 1SS53
D177 1SS53
D178 1SS53
D179 1SS53
D180 1SS53
D181 1SS53
D182 1SS53
D183 1SS53
D184 1SS53
D185 1SS53
D186 1SS53
D187 1SS53
D188 1SS53
D189 1SS53
D190 1SS53
D191 1SS53
D192 1SS53
D193 1SS53
D194 1SS53
D195 1SS53
D196 1SS53
D197 1SS53
D198 1SS53
D199 1SS53
D200 1SS53
D201 1SS53
D202 1SS53
D203 1SS53
D204 1SS53
D205 1SS53
D206 1SS53
D207 1SS53
D208 1SS53
D209 1SS53
D210 1SS53
D211 1SS53
D212 1SS53
D213 1SS53
D214 1SS53
D215 1SS53
D216 1SS53
D217 1SS53
D218 1SS53
D219 1SS53
D220 1SS53
D221 1SS53
D222 1SS53
D223 1SS53
D224 1SS53
D225 1SS53
D226 1SS53
D227 1SS53
D228 1SS53
D229 1SS53
D230 1SS53
D231 1SS53
D232 1SS53
D233 1SS53
D234 1SS53
D235 1SS53
D236 1SS53
D237 1SS53
D238 1SS53
D239 1SS53
D240 1SS53
D241 1SS53
D242 1SS53
D243 1SS53
D244 1SS53
D245 1SS53
D246 1SS53
D247 1SS53
D248 1SS53
D249 1SS53
D250 1SS53
D251 1SS53
D252 1SS53
D253 1SS53
D254 1SS53
D255 1SS53
D256 1SS53
D257 1SS53
D258 1SS53
D259 1SS53
D260 1SS53
D261 1SS53
D262 1SS53
D263 1SS53
D264 1SS53
D265 1SS53
D266 1SS53
D267 1SS53
D268 1SS53
D269 1SS53
D270 1SS53
D271 1SS53
D272 1SS53
D273 1SS53
D274 1SS53
D275 1SS53
D276 1SS53
D277 1SS53
D278 1SS53
D279 1SS53
D280 1SS53
D281 1SS53
D282 1SS53
D283 1SS53
D284 1SS53
D285 1SS53
D286 1SS53
D287 1SS53
D288 1SS53
D289 1SS53
D290 1SS53
D291 1SS53
D292 1SS53
D293 1SS53
D294 1SS53
D295 1SS53
D296 1SS53
D297 1SS53
D298 1SS53
D299 1SS53
D300 1SS53
D301 1SS53
D302 1SS53
D303 1SS53
D304 1SS53
D305 1SS53
D306 1SS53
D307 1SS53
D308 1SS53
D309 1SS53
D310 1SS53
D311 1SS53
D312 1SS53
D313 1SS53
D314 1SS53
D315 1SS53
D316 1SS53
D317 1SS53
D318 1SS53
D319 1SS53
D320 1SS53
D321 1SS53
D322 1SS53
D323 1SS53
D324 1SS53
D325 1SS53
D326 1SS53
D327 1SS53
D328 1SS53
D329 1SS53
D330 1SS53
D331 1SS53
D332 1SS53
D333 1SS53
D334 1SS53
D335 1SS53
D336 1SS53
D337 1SS53
D338 1SS53
D339 1SS53
D340 1SS53
D341 1SS53
D342 1SS53
D343 1SS53
D344 1SS53
D345 1SS53
D346 1SS53
D347 1SS53
D348 1SS53
D349 1SS53
D350 1SS53
D351 1SS53
D352 1SS53
D353 1SS53
D354 1SS53
D355 1SS53
D356 1SS53
D357 1SS53
D358 1SS53
D359 1SS53
D360 1SS53
D361 1SS53
D362 1SS53
D363 1SS53
D364 1SS53
D365 1SS53
D366 1SS53
D367 1SS53
D368 1SS53
D369 1SS53
D370 1SS53
D371 1SS53
D372 1SS53
D373 1SS53
D374 1SS53
D375 1SS53
D376 1SS53
D377 1SS53
D378 1SS53
D379 1SS53
D380 1SS53
D381 1SS53
D382 1SS53
D383 1SS53
D384 1SS53
D385 1SS53
D386 1SS53
D387 1SS53
D388 1SS53
D389 1SS53
D390 1SS53
D391 1SS53
D392 1SS53
D393 1SS53
D394 1SS53
D395 1SS53
D396 1SS53
D397 1SS53
D398 1SS53
D399 1SS53
D400 1SS53
D401 1SS53
D402 1SS53
D403 1SS53
D404 1SS53
D405 1SS53
D406 1SS53
D407 1SS53
D408 1SS53
D409 1SS53
D410 1SS53
D411 1SS53
D412 1SS53
D413 1SS53
D414 1SS53
D415 1SS53
D416 1SS53
D417 1SS53
D418 1SS53
D419 1SS53
D420 1SS53
D421 1SS53
D422 1SS53
D423 1SS53
D424 1SS53
D425 1SS53
D426 1SS53
D427 1SS53
D428 1SS53
D429 1SS53
D430 1SS53
D431 1SS53
D432 1SS53
D433 1SS53
D434 1SS53
D435 1SS53
D436 1SS53
D437 1SS53
D438 1SS53
D439 1SS53
D440 1SS53
D441 1SS53
D442 1SS53
D443 1SS53
D444 1SS53
D445 1SS53
D446 1SS53
D447 1SS53
D448 1SS53
D449 1SS53
D450 1SS53
D451 1SS53
D452 1SS53
D453 1SS53
D454 1SS53
D455 1SS53
D456 1SS53
D457 1SS53
D458 1SS53
D459 1SS53
D460 1SS53
D461 1SS53
D462 1SS53
D463 1SS53
D464 1SS53
D465 1SS53
D466 1SS53
D467 1SS53
D468 1SS53
D469 1SS53
D470 1SS53
D471 1SS53
D472 1SS53
D473 1SS53
D474 1SS53
D475 1SS53
D476 1SS53
D477 1SS53
D478 1SS53
D479 1SS53
D480 1SS53
D481 1SS53
D482 1SS53
D483 1SS53
D484 1SS53
D485 1SS53
D486 1SS53
D487 1SS53
D488 1SS53
D489 1SS53
D490 1SS53
D491 1SS53
D492 1SS53
D493 1SS53
D494 1SS53
D495 1SS53
D496 1SS53
D497 1SS53
D498 1SS53
D499 1SS53
D500 1SS53
D501 1SS53
D502 1SS53
D503 1SS53
D504 1SS53
D505 1SS53
D506 1SS53
D507 1SS53
D508 1SS53
D509 1SS53
D510 1SS53
D511 1SS53
D512 1SS53
D513 1SS53
D514 1SS53
D515 1SS53
D516 1SS53
D517 1SS53
D518 1SS53
D519 1SS53
D520 1SS53
D521 1SS53
D522 1SS53
D523 1SS53
D524 1SS53
D525 1SS53
D526 1SS53
D527 1SS53
D528 1SS53
D529 1SS53
D530 1SS53
D531 1SS53
D532 1SS53
D533 1SS53
D534 1SS53
D535 1SS53
D536 1SS53
D537 1SS53
D538 1SS53
D539 1SS53
D540 1SS53
D541 1SS53
D542 1SS53
D543 1SS53
D544 1SS53
D545 1SS53
D546 1SS53
D547 1SS53
D548 1SS53
D549 1SS53
D550 1SS53
D551 1SS53
D552 1SS53
D553 1SS53
D554 1SS53
D555 1SS53
D556 1SS53
D557 1SS53
D558 1SS53
D559 1SS53
D560 1SS53
D561 1SS53
D562 1SS53
D563 1SS53
D564 1SS53
D565 1SS53
D566 1SS53
D567 1SS53
D568 1SS53
D569 1SS53
D570 1SS53
D571 1SS53
D572 1SS53
D573 1SS53
D574 1SS53
D575 1SS53
D576 1SS53
D577 1SS53
D578 1SS53
D579 1SS53
D580 1SS53
D581 1SS53
D582 1SS53
D583 1SS53
D584 1SS53
D585 1SS53
D586 1SS53
D587 1SS53
D588 1SS53
D589 1SS53
D590 1SS53
D591 1SS53
D592 1SS53
D593 1SS53
D594 1SS53
D595 1SS53
D596 1SS53
D597 1SS53
D598 1SS53
D599 1SS53
D600 1SS53
D601 1SS53
D602 1SS53
D603 1SS53
D604 1SS53
D605 1SS53
D606 1SS53
D607 1SS53
D608 1SS53
D609 1SS53
D610 1SS53
D611 1SS53
D612 1SS53
D613 1SS53
D614 1SS53
D615 1SS53
D616 1SS53
D617 1SS53
D618 1SS53
D619 1SS53
D620 1SS53
D621 1SS53
D622 1SS53
D623 1SS53
D624 1SS53
D625 1SS53
D626 1SS53
D627 1SS53
D628 1SS53
D629 1SS53
D630 1SS53
D631 1SS53
D632 1SS53
D633 1SS53
D634 1SS53
D635 1SS53
D636 1SS53
D637 1SS53
D638 1SS53
D639 1SS53
D640 1SS53
D641 1SS53
D642 1SS53
D643 1SS53
D644 1SS53
D645 1SS53
D646 1SS53
D647 1SS53
D648 1SS53
D649 1SS53
D650 1SS53
D651 1SS53
D652 1SS53
D653 1SS53
D654 1SS53
D655 1SS53
D656 1SS53
D657 1SS53
D658 1SS53
D659 1SS53
D660 1SS53
D661 1SS53
D662 1SS53
D663 1SS53
D664 1SS53
D665 1SS53
D666 1SS53
D667 1SS53
D668 1SS53
D669 1SS53
D670 1SS53
D671 1SS53
D672 1SS53
D673 1SS53
D674 1SS53
D675 1SS53
D676 1SS53
D677 1SS53
D678 1SS53
D679 1SS53
D680 1SS53
D681 1SS53
D682 1SS53
D683 1SS53
D684 1SS53
D685 1SS53
D686 1SS53
D687 1SS53
D688 1SS53
D689 1SS53
D690 1SS53
D691 1SS53
D692 1SS53
D693 1SS53
D694 1SS53
D695 1SS53
D696 1SS53
D697 1SS53
D698 1SS53
D699 1SS53
D700 1SS53
D701 1SS53
D702 1SS53
D703 1SS53
D704 1SS53
D705 1SS53
D706 1SS53
D707 1SS53
D708 1SS53
D709 1SS53
D710 1SS53
D711 1SS53
D712 1SS53
D713 1SS53
D714 1SS53
D715 1SS53
D716 1SS53
D717 1SS53
D718 1SS53
D719 1SS53
D720 1SS53
D721 1SS53
D722 1SS53
D723 1SS53
D724 1SS53
D725 1SS53
D726 1SS53
D727 1SS53
D728 1SS53
D729 1SS53
D730 1SS53
D731 1SS53
D732 1SS53
D733 1SS53
D734 1SS53
D735 1SS53
D736 1SS53
D737 1SS53
D738 1SS53
D739 1SS53
D740 1SS53
D741 1SS53
D742 1SS53
D743 1SS53
D744 1SS53
D745 1SS53
D746 1SS53
D747 1SS53
D748 1SS53
D749 1SS53
D750 1SS53
D751 1SS53
D752 1SS53
D753 1SS53
D754 1SS53
D755 1SS53
D756 1SS53
D757 1SS53
D758 1SS53
D759 1SS53
D760 1SS53
D761 1SS53
D762 1SS53
D763 1SS53
D764 1SS53
D765 1SS53
D766 1SS53
D767 1SS53
D768 1SS53
D769 1SS53
D770 1SS53
D771 1SS53
D772 1SS53
D773 1SS53
D774 1SS53
D775 1SS53
D776 1SS53
D777 1SS53
D778 1SS53
D779 1SS53
D780 1SS53
D781 1SS53
D782 1SS53
D783 1SS53
D784 1SS53
D785 1SS53
D786 1SS53
D787 1SS53
D788 1SS53
D789 1SS53
D790 1SS53
D791 1SS53
D792 1SS53
D793 1SS53
D794 1SS53
D795 1SS53
D796 1SS53
D797 1SS53
D798 1SS53
D799 1SS53
D800 1SS53
D801 1SS53
D802 1SS53
D803 1SS53
D804 1SS53
D805 1SS53
D806 1SS53
D807 1SS53
D808 1SS53
D809 1SS53
D810 1SS53
D811 1SS53
D812 1SS53
D813 1SS53
D814 1SS53
D815 1SS53
D816 1SS53
D817 1SS53
D818 1SS53
D819 1SS53
D820 1SS53
D821 1SS53
D822 1SS53
D823 1SS53
D824 1SS53
D825 1SS53
D826 1SS53
D827 1SS53
D828 1SS53
D829 1SS53
D830 1SS53
D831 1SS53
D832 1SS53
D833 1SS53
D834 1SS53
D835 1SS53
D836 1SS53
D837 1SS53
D838 1SS53
D839 1SS53
D840 1SS53
D841 1SS53
D842 1SS53
D843 1SS53
D844 1SS53
D845 1SS53
D846 1SS53
D847 1SS53
D848 1SS53
D849 1SS53
D850 1SS53
D851 1SS53
D852 1SS53
D853 1SS53
D854 1SS53
D855 1SS53
D856 1SS53
D857 1SS53
D858 1SS53
D859 1SS53
D860 1SS53
D861 1SS53
D862 1SS53
D863 1SS53
D864 1SS53
D865 1SS53
D866 1SS53
D867 1SS53
D868 1SS53
D869 1SS53
D870 1SS53
D871 1SS53
D872 1SS53
D873 1SS53
D874 1SS53
D875 1SS53
D876 1SS53
D877 1SS53
D878 1SS53
D879 1SS53
D880 1SS53
D881 1SS53
D882 1SS53
D883 1SS53
D884 1SS53
D885 1SS53
D886 1SS53
D887 1SS53
D888 1SS53
D889 1SS53
D890 1SS53
D891 1SS53
D892 1SS53
D893 1SS53
D894 1SS53
D895 1SS53
D896 1SS53
D897 1SS53
D898 1SS53
D899 1SS53
D900 1SS53
D901 1SS53
D902 1SS53
D903 1SS53
D904 1SS53
D905 1SS53
D906 1SS53
D907 1SS53
D908 1SS53
D909 1SS53
D910 1SS53
D911 1SS53
D912 1SS53
D913 1SS53
D914 1SS53
D915 1SS53
D916 1SS53
D917 1SS53
D918 1SS53
D919 1SS53
D920 1SS53
D921 1SS53
D922 1SS53
D923 1SS53
D924 1SS53
D925 1SS53
D926 1SS53
D927 1SS53
D928 1SS53
D929 1SS53
D930 1SS53
D931 1SS53
D932 1SS53
D933 1SS53
D934 1SS53
D935 1SS53
D936 1SS53
D937 1SS53
D938 1SS53
D939 1SS53
D940 1SS53
D941 1SS53
D942 1SS53
D943 1SS53
D944 1SS53
D945 1SS53
D946 1SS53
D947 1SS53
D948 1SS53
D949 1SS53
D950 1SS53
D951 1SS53
D952 1SS53
D953 1SS53
D954 1SS53
D955 1SS53
D956 1SS53
D957 1SS53
D958 1SS53
D959 1SS53
D960 1SS53
D961 1SS53
D962 1SS53
D963 1SS53
D964 1SS53
D965 1SS53
D966 1SS53
D967 1SS53
D968 1SS53
D969 1SS53
D970 1SS53
D971 1SS53
D972 1SS53
D973 1SS53
D974 1SS53
D975 1SS53
D976 1SS53
D977 1SS53
D978 1SS53
D979 1SS53
D980 1SS53
D981 1SS53
D982 1SS53
D983 1SS53
D984 1SS53
D985 1SS53
D986 1SS53
D987 1SS53
D988 1SS53
D989 1SS53
D990 1SS53
D991 1SS53
D992 1SS53
D993 1SS53
D994 1SS53
D995 1SS53
D996 1SS53
D997 1SS53
D998 1SS53
D999 1SS53
D1000 1SS53


LOGIC
RAM
RELAY
IC 3 μPD78016 114
IC 7 μPD4013BC
IC 8 TC4528BP
IC 6 SN74LS377N
IC 11 SN74LS175N
IC 14 M50780SP
IC 15 BA616
IC 16 DAN401
IC 17 SN74LS08N
IC 18 SN74LS08N
SN74LS11N
SN74LS02N
SN74LS32N
IC 19 TA78L008AP
SPEAK (OPTION)
FILTER P1
MAIN P1
KEY


PLL
LPL
KEYER
RF
MAIN P1
FILTER P1


PLL
IC204 M54459L
IC203 5H74LS90N
IC4 μPC1037H
IC5 SN74LS90N
IC3 μPC1037H
IC8 7805
IC7 TA78L006AP
IC6 TC5082P-GL
BT01RN1-A61
FI-1 FL-69
10.24 MHz
5V
8V
SUB LOOP OUT
LO
MIX
IF
ANT
TRV
AFT
GMR
LBM


D23~D40 1SS53